

DOCTORAL DISSERTATION

Abstract

Bergquist, M. (2018). *Using Social Norms in Energy Conservation Interventions*. Department of Psychology, University of Gothenburg, Sweden.

When designing interventions to promote pro-environmental behaviors, practitioners may choose between techniques based on, for example education, incentives, or social norms. These intervention techniques may, however, target different kinds of motivation, and therefore differ in psychological and behavioral implications. The aim of this thesis is to assess norm-based intervention techniques targeting energy conservation.

Study I compared a contest-based with a norm-based intervention technique. In two online experiments participants performed pro-environmental tasks (writing energy-saving tips and fictive recycling) while provided with either normative or competitive feedback. Results showed that participants assigned to the contest-based intervention technique engaged more intensively in both tasks. Participants in the norm-based intervention technique showed a tendency for stronger intention for future energy conservation and stronger activation of personal norms for non-targeted pro-environmental behaviors.

Study II applied the findings from Study I in two field experiments. Participants were assigned to a norm-based or a contest-based intervention targeting electricity conservation. Both experiments confirmed an intensive but short-lived effect of electricity conservation in the contest. Experiment 1 confirmed increased electricity saving attitudes and more long-term electricity conservation in the norm-based interventions. Experiment 2 did not replicate these findings, but supported a positive spillover effect between electricity and water conservation in the norm-based intervention.

Study III tested a conceptual development of the descriptive norm. Analogous to the separation between injunctive proscriptive and prescriptive norms, we suggest that the descriptive norm can be separated into signaling others' engagement (a descriptive "do-norm") or disengagement (a descriptive "don't-norm"). In line with our hypothesis that don't-norms are more influential, results from three experiments consistently showed that don't-norms outperformed do-norms (15%, 10% and 19%). However, only the third experiment supported the difference with statistical significance.

Study IV examined compliance to prescriptive and proscriptive norms, targeting energy conservation. In a 2 (words: prescription vs. proscription) × 2 (picture: prescription vs. proscription) between-subject design, participants were exposed to prompts promoting energy-saving. Results supported the hypothesis, showing that more participants (88.1%) conformed to prompts including both prescriptive and proscriptive content than to prompts including either prescriptions or proscriptions (78.6%). A follow-up experiment indicated that these results were driven by attention and reactance. Finally, when asked which prompt participants would use to influence other people to act pro-environmentally, the majority of participants (80.1%) chose the prompt that was least effective in our field experiment.

Keywords: Social norms, Interventions, Contests, Pro-environmental behaviors

Magnus Bergquist, Department of Psychology, University of Gothenburg, Box 500, 403 30 Gothenburg, Sweden. E-mail: magnus.bergquist@psy.gu.se

ISBN: 978-91-984488-0-1 ISSN: 1101-718X Avhandlingen/Göteborgs universitet. Psykologiska inst.

USING SOCIAL NORMS IN ENERGY CONSERVATION INTERVENTIONS

Magnus Bergquist
Department of Psychology
2018

Avhandling för avläggande av filosofie doktorsexamen i psykologi som med vederbörligt tillstånd av samhällsvetenskapliga fakulteten vid Göteborgs universitet kommer att offentligt försvaras fredagen den 12 januari 2018, kl. 10:00, Sal F1, Psykologiska institutionen, Haraldsgatan 1, Göteborg.

Fakultetsopponent: Professor Robert Gifford, Department of Psychology, University of Victoria, Victoria V8W 3P5, Canada

This licentiate thesis is based on a summary and the following four studies, which are referred to by their Roman numerals:

- I. Bergquist, M., Nilsson, A., & Hansla, A. (2017). Contests versus norms: Implications of contest-based and norm-based intervention techniques. *Frontiers in Psychology*, 8:2046.
- II. Bergquist, M., Nilsson, A., & Ejelöv, E. (2017). Contest-based and norm-based interventions: (How) do they affect attitudes, norms and behaviors? Manuscript submitted.
- III. Bergquist, M., & Nilsson, A. (2017). The Do's and Don'ts in social norms: An avoidance-based descriptive norm increases conformity. Manuscript submitted.
- IV. Bergquist, M., & Nilsson, A. (2016). I saw the sign: Promoting energy conservation via normative prompts. *Journal of Environmental Psychology*, 46, 23-31.



UNIVERSITY OF GOTHENBURG

Using Social Norms in Energy Conservation Interventions

Magnus Bergquist



UNIVERSITY OF GOTHENBURG

Department of Psychology

Doctoral Dissertation in Psychology
Department of Psychology
University of Gothenburg
2018-01-12

© Magnus Bergquist
Printed: Ineko AB, Gothenburg, Sweden, 2017
ISSN: 1101-718X Avhandlingen/ Göteborgs Universitet, Psykologiska inst.
ISRN: GU/PSYK/AVH—353--SE

ABSTRACT

Bergquist, M. (2018). *Using Social Norms in Energy Conservation Interventions*. Department of Psychology, University of Gothenburg, Sweden.

When designing interventions to promote pro-environmental behaviors, practitioners may choose between techniques based on, for example, education, incentives, or social norms. These intervention techniques may, however, target different kinds of motivation, and therefore differ in their psychological and behavioral implications. The aim of this thesis is to assess norm-based intervention techniques targeting energy conservation.

Study I compared a contest-based with a norm-based intervention technique. In two online experiments participants performed pro-environmental tasks (writing energy-saving tips and fictive recycling) while provided with either normative or competitive feedback. Results showed that participants assigned to the contest-based intervention technique engaged more intensively in both tasks. Participants in the norm-based intervention technique showed a tendency for stronger intention for future energy conservation and stronger activation of personal norms for non-targeted pro-environmental behaviors.

Study II applied the findings from Study I in two field experiments. Participants were randomly assigned to a norm-based or a contest-based intervention targeting electricity conservation. In the contest, both experiments confirmed an intensive but short-lived effect of electricity conservation. Experiment 1 confirmed increase electricity saving attitudes and more long-term electricity conservation in the norm-based interventions. Results of Experiment 2 did not replicate these findings, but supported a positive spillover effect between electricity and water conservation only in the norm-based intervention.

Study III tested a conceptual development of the descriptive norm. Analogous to the separation between injunctive proscriptive and prescriptive norms, we suggest that the descriptive norm can be separated into signaling others' engagement (a descriptive "do-norm") or disengagement (a descriptive "don't-norm"). In line with our hypothesis that don't-norms are more influential, results from three experiments consistently showed that don't-norms outperformed do-norms (15%, 10% and 19%). However, only the third experiment supported the difference with statistical significance.

Study IV examined compliance to prescriptive and proscriptive norms, targeting energy conservation. In a 2 (words: prescription vs. proscription) \times 2 (picture: prescription vs. proscription) between-subject design, participants were exposed to prompts promoting energy-saving. Results supported the hypothesis, showing that more participants (88.1%) conformed to prompts including both prescriptive and proscriptive content than to prompts including either prescriptions or proscriptions (78.6%). A follow-up experiment indicated that these results were driven by attention and reactance. Finally, when asked which prompt participants would use to influence other people to act pro-environmentally, the majority of participants (80.1%) chose the prompt that was least effective in our field experiment.

Keywords: Social norms, Contests, Attitudes, Interventions, Pro-environmental behaviors

Magnus Bergquist, Department of Psychology, University of Gothenburg, Box 500, 403 30 Gothenburg, Sweden. E-mail: magnus.bergquist@psy.gu.se

SWEDISH SUMMARY

Människans klimatpåverkan är en av vår tids största och mest avgörande frågor. Klimatförändringar rubbar jordens ekosystem, vilket leder till bland annat havshöjning, försurning, förlust av biologisk mångfald, nedbrytning av korallrev och glaciärsmältning. Klimatförändringar är också en samhällsfråga, enligt FNs klimatpanel IPCC leder klimatförändringar till minskad ekonomisk tillväxt, ökad fattigdom och urholkad livsmedelssäkring. Miljöpsykologin syftar till att förstå, förklara och främja hållbara beteendemönster. Elförbrukning är ett område som utgör substantiell miljöpåverkan där människors beteenden ligger till grund för kraftiga variationer i elförbrukning mellan hushåll. Målet med den föreliggande avhandlingen är att undersöka om och hur sociala normer kan implementeras i interventionstekniker för att främja elbesparing.

I fyra studier, vilka omfattar nio experiment med totalt 1957 deltagare, undersöks psykologiska och beteendemässiga aspekter av interventionstekniker baserade på sociala normer. I **studie I** jämfördes en tävlingsbaserad interventionsteknik med en normbaserad interventionsteknik. Utifrån Goal-framing teorin förväntades dessa interventionstekniker aktivera olika mål. Den tävlingsbaserade tekniken förväntades aktivera ett vinstmål, där beteende utförs med avsikten att skydda eller öka sina egna resurser. Som ett resultat av vinstmålet förväntades deltagare uppvisa större engagemang, under förutsättning att ökat engagemang är kopplat till större vinst eller ökad chans till vinsten. Vidare förväntades dessa deltagare engagera sig i elbesparing som ett medel för att maximera egennytan, och därmed upphöra med sitt engagemang då detta inte längre är kopplat till ökning av egennytan. I kontrast förväntades den normbaserade tekniken aktivera ett normativt mål, vilket antogs mobilisera respondenternas kognition och motivation i termer av vad som är lämpligt eller vad "man bör" göra. Därför förväntades deltagare i normbetingelsen uttrycka starkare förpliktelser för elbesparing än deltagare i tävlingsbetingelsen. Då elbesparing tolkas i termer av förpliktelse, för deltagare i normbetingelsen, förväntades högre engagemang vara positivt associerat med framtida elbesparing för dessa deltagare. I experiment 1 ombads respondenterna att utgå från ett informationsmaterial och skriva så många "el-spar tips" som möjligt. I tävlingsbetingelsen gavs en monetär belöning till vinnaren vars storlek ökade med antal tips. Respondenterna i normbetingelsen exponerades för en föreskriven norm, via en graf som visade att 90% av andra deltar i experiment anser att energibesparing är positivt. I båda grupperna angavs sju stycket elspartips som medelvärdet för hur många tips som andra deltagare skrev. Denna information förväntades fungera som en beskrivande norm för deltagare i normbetingelsen, men som en riktlinje vilken måste överträffas för att nå vinsten för deltagare i tävlingsbetingelsen. Resultatet visade som förväntat att deltagare i tävlingsbetingelsen skrev fler el-spar tips än deltagare i normbetingelsen. Vidare visade resultatet att intentionen för framtida elbesparing tenderade att vara högre för deltagarna i normbetingelsen. Experiment 1 kunde inte bekräfta att känslan av förpliktelse aktiverades i normbetingelsen. Det andra experimentet (n = 233) använde både text och bild för att inducera en tävlingsbaserad respektive normbaserad interaktionsteknik. Deltagarnas uppgift var att "sortera hushållsavfall". Resultaten var i huvudsak som förväntat. Deltagare i tävlingsbetingelsen arbetade snabbare, men tenderade att göra fler fel, medan deltagare i normbetingelsen tenderade att uttrycka starkare känsla av förpliktelse för elbesparing och acceptans av miljöpolitiska styrmedel (dvs. positiv "spillover" tendens). Teoretiska och praktiska implikationer är bland annat att interventionerna i sig kan inducera olika målbilder vilka leder till skilda psykologiska och beteendemässiga konsekvenser. En fråga för framtida

forskning är om, och i så fall hur, tävlingsbaserade kan integreras i normbaserade interventioner utan att de underminerar normativa målbilder.

Studie II omfattar två fält-experiment. I 19 respektive 206 hushåll mättes deltagares elförbrukning under 1 respektive 3 månaders tid. Deltagarna randomiserades till antingen en tävlingsbaserad eller en normbaserad intervention med avsikten att minska elförbrukning. Samtliga deltagare fick antingen normbaserad eller tävlingsbaserad information för att motivera dem att spara el. Resultat från det första fält-experimentet visade som förväntat att deltagare i den tävlingsbaserade interventionen sparade mycket el, men endast under en kort period. Från att ha sparat mycket el under den första veckan av interventionen ökade elförbrukningen redan under den andra veckan och stabiliserades sedan på denna nivå även efter interventionen. I linje med vår hypotes så sjönk elförbrukningen gradvis för deltagare i den normbaserade interventionen. Vidare så indikerar deskriptiv data att deltagare i den normbaserade interventionen sparade mer el än deltagare i den tävlingsbaserade interventionen under de närmaste veckorna efter att interventionen avslutats. Vi fann stöd för hypotesen att endast deltagare i den normbaserade interventionen stärkte sina attityder till elbesparing efter intervention jämfört med innan interventionen. Hypotesen att deltagare i den normbaserade interventionen skulle uttrycka starkare personliga elbesparingsnormer fick inte stöd. Det andra fält-experimentet replikerade delvis det första fält-experimenten. Resultat visade återigen att deltagare som randomiserats till en tävlingsbaserad intervention engagerade sig intensivt i elbesparing under första halvan av interventionen, för att sedan öka sin elförbrukning. Experiment 2 replikerade inte effekten av elbesparing för den normbaserade interventionen, data visade att dessa deltagare inte skiljde sig signifikant från deltagare i kontrollgruppen (deltagare som varken fått tävlingsbaserad eller normbaserad information om elbesparing). Det andra fält-experimentet fann inte några skillnader i personliga elbesparingsnormer mellan grupperna. I motsats till vår hypotes fann experiment 2 att attityder till elbesparing ökade för deltagare i den tävlingsbaserade interventionen. Eftersom vi förväntat oss att deltagare i den normbaserade interventionen skulle uttrycka starkare förpliktelser för elbesparing, men också även för andra miljövänliga beteenden. I linje med denna hypotes fann vi att endast deltagare i den normbaserade interventionen visade ett positivt samband mellan elbesparing och vattenbesparing. I enlighet med studie I experiment 2 indikerar dessa data att interventionsteknikerna skiljer sig åt i termer av att påverka miljövänligt beteende som inte är direkt kopplat till själva interventionen.

Studie III avsåg att pröva hypotesen att beskrivande normer kan delas upp i två typer. I analogi med uppdelningen av föreskrivna påbuds-normer kontra förbudsnormer, föreslogs att den beskrivande normen kan signalera vad andra människor gör (do-normen), men också vad andra människor *inte* gör (don't-normen). Således föreslås att människor kan följa beskrivande normer antingen för att de vill göra som andra människor gör, eller för att de vill undvika det som andra människor undviker. Tidigare forskning kring beskrivande normer har exklusivt fokuserat på det som vi kallar för do-normen. Psykologisk forskning visar att människor har en generell disposition för att väga negativ information tyngre än positiv information. Därför förväntade vi oss att människor kommer att anpassa sig efter don't-normen i högre utsträckning än do-normen. I tre experiment fick deltagare göra fiktiva val mellan miljövänliga eller konventionella produkter som presenterades i samband med en do-norm, en don't-norm eller en kontrollbetingelse. Trots att endast ett av tre experiment kunde belägga vår hypotes med statistisk signifikans så fann vi ett konsekvent mönster där människor anpassade sig efter don't-normen i högre utsträckning än do-normen (15%, 10%, respektive 19%). En möjlig förklaring är att människor tolkar konsekvensen av att inte följa dessa normer olika: att inte följa vad andra gör (do-normen) tolkas som en möjlig utebliven

chans för något positivt, medan att inte följa det andra undviker (don't-normen) tolkas som en möjlig risk för något negativt.

Studie IV innefattar ett fältexperiment ($n = 384$) och en online enkät ($n = 185$), med syftet att undersöka en uppmärksamhet-reaktans proposition vilken förväntades öka inflytandet av hur normativ information påverkar faktiskt elbesparing (antal personer som släckte lampan efter sig då de lämnade en offentlig toalett). Ett fältexperiment replikerade först tidigare studier, genom att visa att en släckt lampa (vilket implicerar att andra personer släckt lampan efter sig och därmed signalerar en typ av deskriptiv norm) resulterade i att fler personer också släckte lampan efter sig (74.3 %) jämfört med om lampan var tänd (54 %). För att testa uppmärksamhet-reaktans propositionen jämfördes två undertyper av den föreskrivna normen (påbud och förbud) via fyra påminnelse skyltar, två som innefattade enskilda föreskrivna normer (endast påbud eller endast förbud) och två som innefattade dubbla föreskrivna normer (kombination av påbud och förbud). Dessa normer uttrycktes både i text "släck lampan tack!" (påbud) eller "lämna inte lampan på!" (förbud), och bild via ikoner som antogs signalera "gillande" eller "ogillande". Resultaten bekräftade inte den första hypotesen, då påminnelse skylten som endast inkluderade förbud *inte* ledde till att färre släckte lampan än påminnelse skylten som endast inkluderade påbud. Men i linje med hypotes två ledde påminnelse skyltar som inkluderade dubbla föreskrivna normer till högre elbesparing än de som inkluderade enskilda föreskrivna normer. Dessa resultat förklaras genom att förbudet väckte större uppmärksamhet, eftersom förbudet inducerade negativ affekt, men samtidigt begränsades följsamheten av förbudet på grund av en ökad vilja att trotsa ("reaktans"). Den starka effekten av dubbla föreskrivna normer antas bero på att dessa skyltar både väckte uppmärksamhet via förbudet och samtidigt också mildrade viljan att trotsa genom påbudet, då påbudet upplevdes som mer positivt. I ett uppföljande online experiment mättes hur deltagarna uppfattade påminnelse skyltarna med avseende på känsloreaktion och reaktans. Resultaten gav partiellt stöd till uppmärksamhet-reaktans propositionen. Slutligen tillfrågades deltagarna vilken påminnelse skylt de skulle använda för att påverka så många som möjligt att släcka lampan efter sig. Resultatet visade att majoriteten (80.1%) av deltagarna då valde denna påminnelse skylt (endast påbud) som bidrog till lägst elbesparing i fältexperimentet.

ACKNOWLEDGEMENTS

First, I would like to thank my supervisor Associate Professor Andreas Nilsson for giving me the opportunity, responsibility, and freedom to work in this project. Thank you for your motivation, support and friendship.

I would also like to thank my second supervisor Professor Carl-Martin Allwood, and Professor Trevor Archer, Juliane Buecker, Dr. Erik Mac Giolla, Professor Tommy Gärling, David Neequaye, Associate Professor Annika Nordlund, Professor Wesley Schultz and Professor John Thøgersen for taking their time to read my material and provide comments of earlier drafts.

I would also like to thank my examiner Professor Leif Strömwall, the opponent Professor Robert Gifford, and the examination committee Associate Professor Karl Ask, Professor Sverker Jagers, and Associate Professor Annika Nordlund.

For discussions and feedback, I would like to thank all the members of the Environmental Psychology Unit (EPU), Social Cognition, Judgment and Decision Making (SOC-JDM) and Centre for Collective Action Research (CeCAR), especially Dr. André Hansla and Emma Ejelöv.

Thanks to all coworkers at the Department of Psychology and a special thanks to Ann Backlund.

To my parents Agneta and Christer and my sister Ellen for your support.

Josefin, thank you for all your motivation and love.

For our past and future joy, Brorsan and my daughter Lo.

*Magnus Bergquist
Gothenburg, December 2017*

This research was financially supported by the Swedish Energy Agency (40242-1), awarded to Andreas Nilsson, University of Gothenburg.

PREFACE

This thesis is based on the following four studies, which will be referred to by their Roman numerals:

- V. Bergquist, M., Nilsson, A., & Hansla, A. (2017). Contests versus norms: Implications of contest-based and norm-based intervention techniques. *Frontiers in Psychology*, 8:2046.
- VI. Bergquist, M., Nilsson, A., & Ejelöv, E. (2017). Contest-based and norm-based interventions: (How) do they affect attitudes, norms and behaviors? Manuscript submitted.
- VII. Bergquist, M., & Nilsson, A. (2017). The Do's and Don'ts in social norms: An avoidance-based descriptive norm increases conformity. Manuscript submitted.
- VIII. Bergquist, M, & Nilsson, A. (2016). I saw the sign: Promoting energy conservation via normative prompts. *Journal of Environmental Psychology*, 46, 23-31.

TABLE OF CONTENTS

INTRODUCTION	1
PRO-ENVIRONMENTAL BEHAVIORAL CHANGE.....	2
Intervention campaigns	2
Social comparisons in interventions.	5
SALIENCE: VALENCE AND GOAL	7
Valence	7
Goals	9
A PROCESS MODEL OF NORMATIVE INFLUENCE	11
Cognitive basis for conformity to social norms	11
The norm construct	12
Channel	13
Motivation.....	14
Response	16
Aim of the present thesis.....	17
SUMMARY OF EMPIRICAL PAPERS	17
Study I.....	19
Study II.....	22
Study III	24
Study IV	27
GENERAL DISCUSSION	30
Contest-based and norm-based interventions	31
Strengthening normative influence	37
Ethical considerations	39
Limitations	40
Conclusion	41
REFERENCES	41

INTRODUCTION

Developments in technology and organization have increased physical comfort, status, enjoyment, mobility, etc., but have also stressed natural resources and affected the Earth-system (Rockström et al., 2009; Stern, 2000). Environmental problems caused by humans are particularly significant in the five domains of energy, food, and material consumption, transportation, and waste disposal (Stern, 2000). Energy production is still dominated by fossil fuels, including oil and coal, causing substantial CO₂ emissions, 20% of which are due to residential energy consumption (OECD/IEA, 2016), making household energy behavior a noteworthy aspect of environmental impact. Research suggests that everyday individual behavioral change, with little or no reduction in well-being, can lessen these emissions by 20% (Dietz, Gardner, Gilligan, Stern, & Vandenberg, 2009). A question encompassing both societal and psychological implications is therefore how such energy conservation behaviors could be brought into action? Intervention campaigns have been shown to promote pro-health behaviors (Albarraín, Gellete, Earl, Glasman, Durantini, & Ho, 2005) and pro-environmental behaviors (Abrahamse & Steg, 2013), but how should such interventions be designed to successfully promote energy conservation? Steg and Vlek (2009) suggest that a pro-environmental behavioral change program should follow four steps: (1) identify the behavior to be changed, (2) identify factors underlying the behavior, (3) design interventions, and (4) evaluate the intervention. After the targeted behavior has been identified, it is thus important to understand antecedents for behavior change. In general, pro-environmental behavior is more likely to be brought about when interventions target antecedents of pro-environmental actions (Gifford & Nilsson, 2014) and inactions (Gifford, 2011). Defining pro-environmental behavior as “behavior that harms the environment as little as possible or even benefits the environment” (Steg & Vlek, 2009 pp. 309), environmental psychologists are interested in what determines and motivates feelings of obligation, attitudes, and pro-environmental behaviors (Gardner & Stern, 2002).

What then, motivates people to engage in energy conservation? Research has repeatedly demonstrated that social normative information (informing about others behavior) promotes energy conservation (Allcott, 2011; Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007) and is even more effective than financial feedback and individual feedback (Schultz, Messina, Tronu, Limas, Gupta, & Estrada, 2016). Still, other social comparison techniques, such as setting up a contest to promote energy conservation, have gained little attention within environmental psychology. Therefore, this thesis seeks first to compare the norm-based intervention with the contest-based intervention. Second, I wish to assess whether and how the norm-based intervention could be improved by testing new conceptualizations of the social norm construct. This thesis is an investigation of the relative success of intervention techniques based on social norms in promoting residential energy conservation. The aim is to apply social psychological theories of social norms to intervention techniques targeting human behavior and motivation for residential energy conservation.

This summary is organized as follows. First, a review of energy conservation, different forms of intervention techniques, and the role of contests and social norms as a motivator for behavioral change is presented. Second, the role of goals and the salience of social norms are

discussed. Third, a framework of normative influence is proposed in a process model of normative influence. Fourth, a summary of the four studies encompassing nine experiments using social norms to promote energy conservation is followed by a general discussion elaborating the theoretical and practical implications, ethical considerations, and limitations of the studies.

PRO-ENVIRONMENTAL BEHAVIORAL CHANGE

Intervention campaigns

Behavioral change. When targeting residential energy conservation, research has distinguished between two categories of conservation behaviors that reduce energy use within an existing system (*curtailments*) and behaviors that increase energy efficiency through more effective technology (*efficiencies*; Stern & Gardner, 1981). Curtailments (e.g., turning off lights) require repetitive behaviors, may reduce comfort, and tend to be short-term. But they are characterized by low (or no) cost, low effort, and they may have a significant impact on aggregate energy savings (Bator, Tabanico, Walton, & Schultz, 2014). In contrast, efficiencies (e.g., buying energy efficient lightbulbs) require economic investments and may not be justified in all households. However, efficiencies are characterized by one-time behaviors, long-term effects, and minimal lifestyle change. A recent study found that the motivational bases for energy conservation in both curtailments and efficiencies were associated with economic considerations. Environmental motivations and concerns were the two strongest predictors of curtailments, while homeownership was the strongest predictor of efficiencies. Moreover, these two categories of energy conservation behaviors can be complemented by a third category of *maintenance*, energy-saving behaviors that are both infrequent and low cost, for example setting the thermostat back at night (Karlin, David, Sanguinetti, Gamble, Kirkby, & Stokols, 2014). Another way to promote sustainable energy usage is through promoting policies to support or accept the expansion of renewable energy (Thøgersen & Noblet, 2012) or Smart Grids (Broman Toft, Schuitema, & Thøgersen, 2014; see also Schuitema & Bergstad Jacobsson, 2012).

Interventions. In a first step toward a taxonomy of behavioral change interventions, Abraham and Michie (2008) identified 26 separate techniques, including providing information on consequences, providing information about others' approval, and providing feedback on performance. Research has also shown that behavioral change interventions differ in their behavioral and psychological effects (Abrahamse, Steg, Vlek, & Rothengatter, 2005). For example, environmental information or health-based information has been shown to be more effective in reducing electricity usage than financial information (Asensio & Delmas, 2015, see also Bolderdijk, Steg, Geller, Lehman, & Postmes, 2012); social normative information has been shown to reduce electricity usage more than individual feedback and monetary feedback (Schultz, Estrada, Schmitt, Sokoloski, & Silva-Send, 2015); and educational information has been shown to have very little effect on behavior (e.g., Atkins 2001; Kollmuss & Agyeman, 2002). Still, pro-environmental intervention campaigns often rely on the tenet that educational information will lead to behavioral change (Gifford, 2014). Although social norms are highly influential in energy conservation behaviors, when asked about what motivates them to save energy, people have shown to rate social norms as the least important motivator (Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008). These

examples cast light on the importance of evaluating both behavioral and psychological implications of behavioral change interventions, as peoples' intuition and practitioners' methods for behavioral change may be biased.

Several shortcomings are common in intervention designs. First, the underlying antecedents of behavioral change are often unclear, as is whether the interventions are supposed to influence attitudes, beliefs, knowledge or behavior (Atkins, 2001; Nilsson & Martinsson, 2012). Second, there is often a lack of rigorous follow-up studies, limiting knowledge of the potential effects of the intervention (Valente, 2001). Finally, and perhaps most importantly, interventions are often not built on a thorough and tested theory explaining why change should be expected. Neglecting this point could, in the worst case, result in influencing individuals to change their behavior in the opposite, unintended, direction (Kok, Schaalma, Ruiter, Brug, & Van Empelen, 2004).

Intervention techniques may be separated into antecedent and consequence techniques (Abrahamse et al., 2005). Antecedent techniques aim to influence determinants of behavioral change by setting a goal for an outcome such as a specific amount of energy conservation. Consequence techniques aim to influence behavioral change through positive or negative consequences, such monetary rewards for engaging in the desired behavior. In their meta-analysis, Abrahamse and Steg (2013) found that interventions based on social influence had a better effect on resource conservation than control conditions (Hedges' $g = 0.35$). More specifically, the most effective intervention technique was to use block leaders (i.e., information is provided by in-group members, Hedges' $g = 0.82$). The second most effective technique were public commitment (i.e., making a pledge to engage in a specific behavior, Hedges' $g = 0.58$) and modeling (i.e., seeing the targeted behavior demonstrated by a confederate, Hedges' $g = 0.51$). Smaller effect sizes were found for group feedback (i.e., feedback about performance on group level, Hedges' $g = 0.29$), social comparative feedback (i.e., informing about comparative relationships between individuals or groups, Hedges' $g = 0.13$) and social norms (i.e., information about other people's behavior and [dis]approval, Hedges' $g = 0.10$). Importantly, the authors note that the most effective techniques used face-to-face interaction, while the least effective were more anonymous, suggesting that the level of anonymity may partially explain these differences. Boomerang effects (increased resource usage among users who are initially low users (Schultz et al., 2007) may partially explain why the social norms approach showed small effects. Abrahamse et al. (2003) first conclude that intervention techniques providing information may increase peoples' knowledge about the issue; however, knowledge does not necessarily result in behavioral change. Second, rewards may change behavior but the effect seems to be short-lived. Finally, feedback may be more successful if given frequently.

Feedback-based interventions. Although feedback can take many forms, it is generally understood as the process of reinforcing and/or modifying future behaviors based on information about past or present behaviors (Karlin, Zinger, & Ford, 2015). Feedback-based interventions have been criticized for being based on limited evidence, lacking user engagement (e.g., motivation and action potential), and risking unintended consequences such as rebound and boomerang effects (Buchanan, Russo, & Anderson, 2015). Recent reviews, however, suggest that feedback may be an effective tool for encouraging energy conservation under certain circumstances (Fischer, 2008; Karlin et al., 2015). For example, a meta-analysis found a main effect of feedback showing a mean effect size of $r = .07$ (95% CI [0.045,

.097]), indicating a small yet significant positive relation between feedback and energy conservation. However, the meta-analysis reported a significant heterogeneity test ($Q = 470.96, p < .001$), suggesting that some feedback techniques lead to substantially more energy conservation than others (Karlin et al., 2015). Fischer (2008, pp. 79) summarized the most effective feedback as “given frequently and over a long time, provides appliance-specific breakdown, is presented in a clear and appealing way, and uses computerized and interactive tools”. Importantly, feedback is a channel to promote behavioral change, through which different forms of intervention techniques may be evaluated. For example, Schultz et al. (2015) compared individual feedback with monetary feedback and normative feedback.

Spillover effects in interventions. Negative spillover effects occur when a pro-environmental behavior decreases the prevalence of a subsequent pro-environmental behavior (see Nilsson, Bergquist, & Schultz, 2016; Truelove, Carrico, Weber, Raimi, & Vandenberg, 2014, for review). For example, energy conservation campaigns have shown to increase water usage (Tiefenbeck, Staake, Roth, & Sachs, 2013¹). A related concept is the rebound effect, when increased efficiencies lead to increased demands (Sorrell, 2009). Studies have found that fuel-efficient vehicles have been associated with increased driving (Matiaske, Menges, & Spiess, 2012). Similarly, Catlin and Wang (2013) found that participants used more paper in the presence of a recycling bin than when only a trash bin was available. The rebound effect may be direct or indirect. In a direct rebound, efficiencies and demands operate within the same system. Installing energy-efficient light bulbs may directly rebound in a decreased tendency to turn off lights. But there is also an indirect rebound effect, in which improved efficiency results in increased demands in separate behaviors. For example, money saved by energy conservation may be used on air travel, hence reducing the positive environmental consequences of energy conservation (Chitnis, Sorrell, Druckman, Firth, & Jackson, 2013; Sorrell, 2009). Another concept related to negative spillover is moral licensing, in which a first moral behavior hinders subsequent moral actions (Mullen & Monin, 2016, see also Blanken, Van de Ven, & Zeelenberg, 2015). In a demonstration of the licensing effect, environmentally friendly consumption licensed people to keep more money for themselves in a one-shot dictator game (Mazar & Zhong, 2010).

There is, however, also a positive spillover effect in which a first behavior promotes similar subsequent behaviors (i.e., spillovers across context or time; Nilsson et al., 2016). For example, sustainable practice (e.g., energy conservation and recycling) in work settings has been shown to promote such behaviors in home settings (Andersson, Eriksson, von Borgstede, 2012; Lee, De Young, & Marans, 1995; Littleford, Ryley, & Firth, 2014; Nik Ramli & Naja, 2011, 2012; Tudor, Barr, Gilg, 2007). Other studies have found that reading self-transcendent reasons to car-share improved frequency of recycling (Evans, Maio, Corner, Hodgetts, Ahmed, & Hahn, 2013), and framing energy conservation as pro-environmental led to stronger intentions for other pro-environmental actions than when energy conservation was framed as financially beneficial (Steinhorst, Klöckner, & Matthies, 2015).

Because the reasons used to urge pro-environmental actions are likely to be important in terms of spillover effects (Thøgersen & Crompton, 2009), we believe that spillover effects

¹ The data were analyzed by a one-tailed rather than two-tailed significance test, so the results should be interpreted with caution.

should be taken into account in both designing and evaluating different forms of energy conservation interventions.

Social comparisons in interventions.

Although previous research shows that pro-environmental behaviors can be promoted when strategies are tailored to individuals or households conditions (Abrahamse, Steg, Vlek, & Rothengatter, 2007), these interventions are often too expensive and difficult to carry out on a large scale. Using social norms could be a cost effective and easily applied alternative (Allcott & Mullainathan, 2010; Hirayama, 2016). Although social comparison techniques (such as using social norms) have received mixed support in past reviews (e.g., Fisher, 2008), it should be noted that a recent meta-analysis demonstrated large variabilities in these techniques (Abrahamse & Steg, 2013), indicating that social comparison can be effective under certain conditions. Moreover, a number of individual studies have supported normative information as an easily applied and effective intervention technique (e.g., Allcott, 2011; Bator et al., 2014; Goldstein, Cialdini, & Griskevicius, 2008; Meeker et al., 2016; Schultz et al., 2007). More recently, another social comparison technique, the contest, has gained attention from both practitioners (e.g., student switch-off) and researchers (e.g., Ro, Bruer, Kuntz, Shukla, & Bensch, 2017). The following sections discuss the theoretical basis and applied potential of contest-based versus norm-based interventions to promote behavioral change.

Contests. Contests can be seen as a form of reward-based intervention, in which people are made to compete against each other over a scarce gain that can only accrue to the winner (Schultz, 2014). The contest also involves a dimension of social comparison. In the contest situation, participants' performances are evaluated in relative terms. That is, winning the contest only implies being better than the next best rather than reaching an absolute standard. For this reason, people are motivated by social comparisons to outperform others in a contest. Social comparisons are also used, however, to adjust behaviors to others when acting upon normative information.

Laboratory experiments suggest that contests can decrease free-rider problems (Bornstein, 1992) and increase group coordination (Bornstein, Gneezy, & Nagel, 2002) in social dilemmas. In trying to promote energy conservation, Reeves, Cummings, Scarborough, and Yeykelis (2015) had people play a social game (including contests). Results showed that this *gamification* led to increased energy conservation in both the laboratory experiments and in a follow-up field experiment. Although few studies have tested the efficiency of contests to promote energy conservation, these results show that contests can influence behavior.

Similar to monetary incentives, the contest may also have an instrumental impact on behavioral change (Bolderdijk & Steg, 2015). In the contest condition, monetary or other incentives are used to promote behavior. From a goal perspective, people act to maximize their own profits, which implies that people become sensitive to informational that could affect their own resources (Lindenberg & Steg, 2007). When framing such a goal, people are likely to be stimulated to perform the targeted behavior for as long as it is associated with winning the prize (e.g., a monetary reward); however, when the direct gain for conducting the targeted behavior diminishes, so will the motivation for conducting the behavior.

Psychological studies have found that monetary incentives (and thus maybe also contests) can decrease people's intentions to conduct the target behavior in the future (Festinger &

Carlsmith, 1959), decrease internal motivation for the targeted behavior (Deci, Koestner, & Ryan, 1999), and decrease perceived personal responsibility to perform the targeted behavior (Frey & Oberholzer-Gee, 1997). Incentive-based inducements may also have unexpected effects on behavior. For example, Gneezy and Rustichini (2000) found that when introducing a fee for delayed pick-up in a daycare, parents were actually less likely to pick up their children in time, plausibly because the monetary incentive crowded out parents' previous feelings of obligation to pick up in time.

Social norms. Normative influence has been described as a social navigation tool in decision making, guiding people toward acting in a socially appropriate way (Morris, Hong, Chiu, & Liu, 2015). In social psychology, social norms are usually defined as "... rules and standards that are understood by members of a group, and that guide and/or constrain social behavior without the force of law." (Cialdini & Trost, 1998, pp. 152). *Conformity* can be defined as "movement toward some norm or standard" (Walker & Heyns, 1962). Hence, norms and conformity are two sides of the same coin, with norms being the force of social influence and conformity the response of adjusting attitudes, cognitions, and/or behaviors to the norm.

Interest in conformity to social norms differs between academic disciplines. In sociology, for example, social norms have been discussed phenomenologically and perceived in terms of constructing social reality in interaction with other people (Berger & Luckmann, 1966, see also Hechter & Opp, 2001), while economists often explore the norm concept in terms of deviation from rational choice in for example capital markets (Hirshleifer & Teoh, 2003) and in dilemma games (Fischbacher, Gaechter, & Fehr, 2001). Social psychologists have primarily been interested in how and when social norms promote or prevent conformity (e.g., Ajzen, 2012; Cialdini & Goldstein, 2004; Festinger, 1953; Latané, 1981; Schwartz, 1977; Triplett, 1898; Willis, 1961). The present thesis takes an applied approach, asking when and how social norms promote conformity in the context of energy conservation.

Classical social psychological studies have demonstrated that groups influence individual judgments and behaviors (Asch, 1956; Milgram, Bickman, & Berkowitz, 1969; Sherif, 1936) and more recent models, such as the theory of planned behavior (Ajzen, 1991; Armitage & Conner, 2001) and the focus theory of normative conduct (FTNC; Cialdini, Reno & Kallgren, 1990) have elaborated the role of social norms. In environmental psychology, normative influence has been used to promote pro-environmental behaviors, such as preventing littering (Cialdini et al., 1990; De Kort, McCalley, & Midden, 2008; Reno, Cialdini, & Kallgren, 1993), using sustainable transportation (Kormos, Gifford, & Brown, 2014), and conservation behaviors such as recycling (Schultz, 1999), reusing shopping bags (De Groot, Abrahamse, & Jones, 2013) and hotel towels (Goldstein et al., 2008; Reese, Loew, & Steffgen, 2014; Schultz, Khazian, & Zaleski, 2008; Terrier & Marfaing, 2015), reducing waste (Hamann, Reese, Seewald, & Loeschinger, 2015), and conserving water (Richetin, Perugini, Mondini, & Hurling, 2014; Schultz et al., 2016) and energy in both residential (Nolan et al., 2008; Schultz et al., 2007; Schultz et al., 2015), and public settings (Bator et al., 2014; Dwyer, Maki, & Rothman, 2015; Oceja & Berenguer, 2009).

Studies have also tested techniques that may increase the impact of norms (Kormos et al., 2014; Winter, Sagarin, Rhoads, Barrett, & Cialdini, 2000). To test such techniques, norms must first be communicated. Cialdini and Trost (1998) suggest that norms could be communicated explicitly through written information (Burger & Shelton, 2011) or implicitly

through observable direct behavior or situational cues (Cialdini, Reno, & Kallgren, 1991; Keizer, Lindenberg, & Steg, 2008, 2013). To increase the impact of social norms, research has focused on whether and how normative information is *salient* and *aligned* (Cialdini, 2003; Cialdini et al., 1991). Cialdini and colleagues (1990) noted that results of past studies on conformity with social norms were mixed and suggested that is because more than one norm apply in a given situation. FTNC proposes that for a specific norm to affect behavior, that the norm must be made salient (Cialdini et al., 1990, 1991). Cialdini et al. first differentiated between an *injunctive norm* (signaling other people's [dis]approval), and a *descriptive norm* (signaling what others are doing). Second, a series of field experiments demonstrated that focusing people's attention on one or both of these norms increased conformity. Although FTNC has shown that the salience of norms promotes conformity (Cialdini et al., 1991), the theory does not explain the process or motivational basis for conformity to social norms. To explain how different motivational basis interact, goal framing theory (GFT) proposes that the normative goal is one of three overarching goals affecting peoples' beliefs and motivation (Lindenberg, 2000, 2001; Lindenberg & Steg, 2007, 2013, Steg, Lindenberg, & Keizer, 2016). The following section elaborates on how valence and goals makes social norms salient and guide cognition and motivation toward conformity to social norms.

SALIENCE: VALENCE AND GOAL

Valence

What makes people attend to A rather than B? In this section I discuss the role of valence and goals as psychological states that affect what people attend to.

Valence. Baumeister, Bratslavsky, Finkenauer, and Vohs (2001) reviewed the phenomenon of negative effects rising more steeply than positive, summarized as "bad is stronger than good." That is, negatively valenced events have a greater impact than positively valenced events. Negative events can be defined as perceived threats or harm of events that have or have not yet occurred (Taylor, 1991). The greater impact of such negative events has been demonstrated, for example, in the loss aversion effect in cognitive psychology (Kahneman & Tversky, 1979) and positive-negative asymmetry in evaluation (Peeters & Czapinski, 1992) and negativity bias in social psychology (Cacioppo & Gardner, 1999), an effect demonstrated as early as 3 months in infants (Kiley Hamlin, Wynn, & Bloom, 2010).

Negativity bias. The positivity offset hypothesis predicts a stronger positive (approach) motivational output at a neutral state (zero input). Such a positive offset may have had an evolutionary advantage, because without a positivity offset, an organism in a neutral environment would not engage in approach tendencies and would therefore learn little about their environment's potential values or threats (Cacioppo & Gardner, 1999). Cacioppo and Berntson (1999) argued that as a consequence of natural selection, the irreversibility of an injurious or fatal assault (which poses a greater threat than missed opportunity) should lead people to usually react more strongly to negative than to positive stimuli. Positive and negative information may, however, be processed by (at least) two parallel systems: one threat-related system channeling negative information and one safety or appetite system channeling positive information. Therefore, behavioral responses to positive versus negative stimuli are not symmetrical (as would be predicted if positive and negative information were processed in one system). For example, although punishments may suppress behaviors, they do not necessarily weaken approach dispositions (Cacioppo & Berntson, 1999).

Emotions. Although there is no commonly agreed-upon definition, an emotion could be defined as a perceptual or intellectual episode (i.e., relatively short-lived) of bodily changes that are both felt and directed (i.e., have an object). Emotions are triggered and guided by at least one appraisal (e.g., good/bad) (Mulligan & Scherer, 2012). One of the Merriam-Webster (2012) definitions of emotion is “a conscious mental reaction (as anger or fear) subjectively experienced as strong feelings usually directed toward a specific object and typically accompanied by physiological and behavioural changes in the body.” An alternative perspective views emotions in terms of activation (activation/deactivation) and valence (pleasant/unpleasant) (Russel & Barrett, 1999). Physical boundaries (approach/avoid) may be one reason for emotional outputs being organized as bipolar, toward or away from the evocative stimulus. This does not, however, imply that such evaluations and/or dichotomous behavioral manifestations are derived from a single bipolar evaluation system (Cacioppo & Gardner, 1999). Positive and negative emotional responses are important to consider in social influence. Negative emotions may be an important motivator for pro-environmental behaviors, for example when individuals are told that their own carbon footprint is larger than average, they may feel personal guilt about their environmental impact (Mallett, Melchiori, & Strickroth, 2013). Guilt, in turn, has been found to mediate increased willingness to conserve energy and pay green taxes (Ferguson & Branscombe, 2010). However, inducing negative emotions to promote pro-environmental behaviors is limited because of reactance effects (Brehm, 1966).

Reactance. Reactance is a psychological response to a perceived threat to one’s freedom, which leads to anti-conformity (acting in opposition to the behavioral command) (Brehm, 1966). In support of the reactance effect, it has been found that negatively worded prompts decrease compliance (e.g., Pennebaker & Sanders, 1976) and that less negatively worded prompts decrease reactance (Duran, Reeder, & Hecht, 1985; Geller, Winett, & Everett, 1982). For example, when trying to reduce littering in a public swimming pool area, Reich and Robertson (1979) found that prompts using strong demands (“don’t litter”) were less successful (50% littered) than prompts using normative demands (“help keep your pool clean”: 20%) and a control condition (30%). From these results, the authors reasoned that external pressure caused by the demanding prompt led to counter-reactive behavioral responses mediated by reactance. Similarly, Sussman and Gifford (2012) found indications of reactance (removed prompts and typed responses describing perceived offense) when using prompts to promote energy conservation in bathrooms.

Valence and attention. Valence has been shown to influence judgment, processing style, and memory (see Schwartz & Clore, 2007 for review). For example, neurological research suggests that negatively valenced stimuli (threat) activate the amygdala, which in turn enhances perception as well as attention (Phelps, 2006). In their classic study, Hansen and Hansen (1988) found that participants were faster in detecting angry faces than happy faces, supporting a threat hypothesis of attention bias. Although some recent research has failed to replicate this effect, other has found information detection to be faster and more efficient for angry faces than for happy faces (Fox et al., 2000). Similarly, Öhman, Flykt, and Esteves (2001) found that participants were faster in detecting fear-relevant pictures (snakes or spiders) than fear-irrelevant pictures (flowers or mushrooms). In general, these findings seem to demonstrate that humans seem to be hard-wired to recognize fear and threat. Although such a threat hypothesis may explain some attention biases, an alternative explanation is the

emotionality hypothesis (i.e., attention bias as consequence of emotional arousal). Attention bias may thus be driven by emotional arousal rather than emotional valence (Lundqvist, Juth, & Öhman, 2014).

In this thesis, studies tested the effectiveness of negatively valenced stimuli to attract attention to normative information and increase the influence of social norms in promoting pro-environmental behavior.

Goals

Goals may be defined as cognitive representations of a desired end state (Kruglanski, 1996). As such, goals guide behaviors (Bagozzi & Dholakia, 1999; Bargh, Chen, & Burrows, 1996) and frame both cognition and affection, in information processing (Cacioppo, Petty, Kao, & Rodriguez, 1986), perception (Bruner & Goodman, 1947), and evaluation (Ferguson & Bargh, 2004). Priming achievement-related goals, which temporarily increases their accessibility, resulted in participants finding more words in a word-search task than in the control condition (Bargh, Gollwitzer, Lee-Chai, Barndollar, & Trötschel, 2001). Similarly, priming business-like objects have shown to increase competitiveness (Kay, Wheeler, Bargh, & Ross, 2004; see also Custers & Aarts, 2005).

Dichotomy goals. In a review of past research on motivation and goals, Elliot (1999) presented a historical argument that the approach/avoidance tendency could be the master dichotomy of goals, described in terms such as curiosity versus flight by William McDougal, and toward versus away by Kurt Lewin. Similarly, William James viewed pleasure as a reinforcer and pain as an inhibitor, while Edward Thorndike's "law of effect" stated that a response is more or less likely to recur depending on whether that response is followed by satisfaction or discomfort. More recent research has elaborated on goals in terms of systems (Shah, Kruglanski, & Friedman, 2003) and focused on cognitive as well as behavioral consequences of goal activation (see Fishbach & Ferguson, 2007).

Goal activation. Goals can become activated by cues related to that goal, for example, Keizer et al. (2008) found that situational cues of disorder spread to corresponding behaviors such as trespassing, littering and even stealing. Another study found that French background music played in a food store increased sales of French wine, while German music increased sales of German wine (North, Hargreaves, & McKendrick, 1997). These studies suggest that priming goals can promote the accessibility of goal-related constructs, increasing positive evaluations and goal congruent behaviors.

Goal competition. In contrast to normative choice theory (e.g., the multi-attribute utility theory), Fishbach and Dhar's (2007) review of dynamic goals suggested that multiple goals do not integrate, but rather inhibit, each other. In line with this proposition, Alberts, Gurguc, Koutroumpis, Martin, Muuls, and Napp (2016) found that adding a competitive element to a norm-based intervention actually inhibited long-term effects of electricity usage, suggesting that an intervention using multiple goals could lead to a less effective intervention than one built on a single goal. Goals thus compete in a system of limited motivational resources. As a consequence of functional self-regulation inter-goal inhibition will pull resources away from non-activated goals to focus on the activated goal. Post-fulfillment inhibition will decrease the influence of an active goal once that goal is fulfilled (Fishbach & Dhar, 2005).

Goal-framing theory. Building on the axiom that cognitive resources are limited when people engage in controlled actions (see Bargh, 1994 for definition), GFT (Lindenberg, 2000; Lindenberg & Steg, 2007) proposes that goals will make certain beliefs and motivations focal. According to GFT, goals can be framed by *situational cues*, steering beliefs and motivations toward a foreground goal while pushing other goals to the background of attention (Lindenberg, 2000, 2001; see also Fishbach & Dhar, 2007, for a discussion of goal competition). For example, when making a consumer decision in the local grocery store, a goal to feel good, to save money, or to act appropriately may direct attention toward products' taste, price, or ethical dimensions. According to GFT (Lindenberg, 2000, 2001), framing one of these goals will affect cognitive processes and may consequently affect consumer choice. As shown in this example and in Figure 1, GFT identifies three overarching goals: (1) the *hedonic goal* activating pleasure seeking, (2) the *gain goal* activating maximization of one's resources, and (3) the *normative goal* to act appropriately.

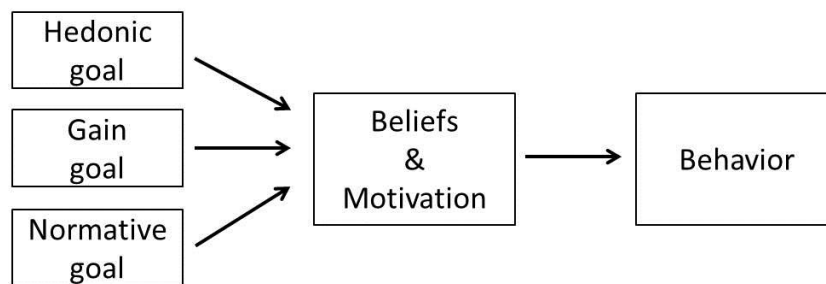


Figure 1. Goal-framing theory predicts that beliefs and motivation will be framed by the three overarching goals: hedonic, gain, and normative goals.

How these goals influence informational processing and behavior will depend on the a priori *hierarchy* of the goals, the *compatibility* of the goals, and *situational framing* (Lindenberg, 2000, 2001; Lindenberg & Steg, 2007, 2013; Steg et al., 2016). First, Lindenberg (2001) proposed that, a priori, the hedonic goal is the strongest and the normative goal the weakest. Hence, the hierarchy of goals suggests that strong external support is needed for the normative goal to be focal (Lindenberg & Steg, 2007). Second, the compatibility of goals for a given situation will govern whether, and how much, the background goals will be pushed away by the focal goal. The three overarching goals are not incongruent per se; rather, their impact on beliefs and motivation will depend of the compatibility of the goals (Lindenberg, 2001). Third, although the overarching goals have an a priori strength and are not necessarily incongruent, it is proposed that situational cues will frame one specific goal, directing people's beliefs and motivational processes in line with that focal goal (Steg et al., 2016). For example, Bateson, Nettle, and Roberts (2006) found that people were more cooperative when exposed to cues of being watched, possibly due to a normative goal frame. In contrast, cooperation have shown to decrease in the presence of luxury brands (Lamy, Guéguen, Fischer-Lokou, & Guegan, 2016) and when primed with money (Vohs, Mead, & Goode, 2006), arguably because people were more influenced by a hedonic or a gain goal frame, pushing away normative considerations. Furthermore, corroborating the relation between gain and normative goals, monetary payments have been shown to induce a *money market frame*, activating a reciprocal relation between people's pay and effort. In contrast, when using non-

monetary incentives, a *social market frame* seems to activate altruistic motives (Heyman & Ariely, 2004). From a goal-framing perspective, the money market may be a consequence of framing a gain goal, while the social market may be a consequence of a normative goal.

In sum, GFT predicts that three overarching psychological goals can be framed by situational goals. Consequently, a normative goal frame will cause people to attend to information about what they ought to do, directing their beliefs and motivations toward appropriate or moral behavior. On the other hand, a hedonic or gain goal may push away normative goals because of a priori strength, incompatibility, or situational framing.

A PROCESS MODEL OF NORMATIVE INFLUENCE

So far, I have discussed environmental problems and intervention techniques with a focus on the role of social norms and the role of valence and goals in promoting conformity to normative information. In this section, I discuss normative influence in more detail. As a framework for reviewing normative influence, a process model of normative influence (PNI) is proposed (see Figure 2).

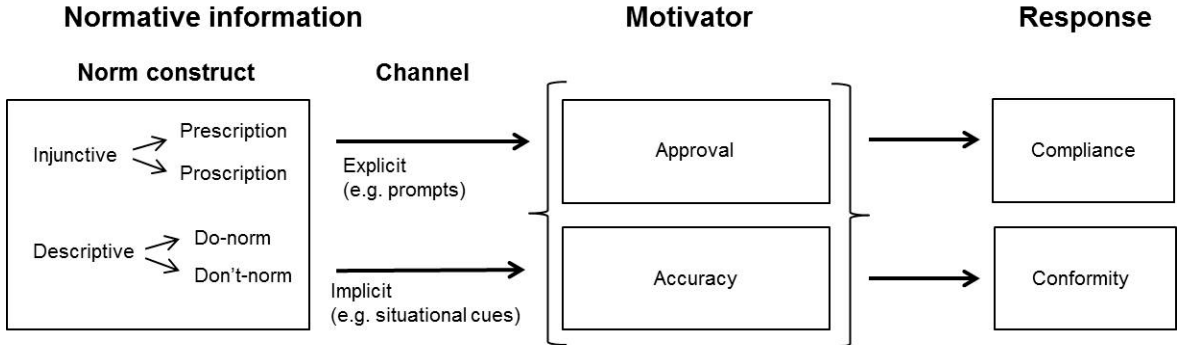


Figure 2. The process model of normative influence integrating the content of normative information, the channel through which the norm is communicated, and plausible mediated motives leading to conformity and/or compliance.

Cognitive basis for conformity to social norms

Guided by others. The ability and motivation to understand and imitate others seems to be a prominent and unique aspect of human behavior. Studies in developmental psychology have found that infants imitate other peoples’ facial expressions as early as 42 minutes after birth (Meltzoff & Moore, 1997), and by nine months of age infants have been shown to imitate more abstract emotional expressions such as joy and sadness (Termine & Izard, 1988). Closely linked to imitating others is the ability to understand other persons’ goals and intentions. *Shared intentionality* has been suggested as a unique feature of human cognition, empowering people to interpret others’ behaviors. That is, when adjusting their behavior to others, people do not simply mimic but have the cognitive capacity to understand and reproduce other people’s intentions as goal-directed actions (Tomasello, Carpenter, Call, Behne, & Moll, 2005). Shared intentionality is therefore an advanced form of imitation, in which other people’s behaviors are coded and reproduced in abstract terms, rather than copied in single concrete actions. For example, after observing an adult failing to perform an action,

18-month-old infants did not imitate the failure, but derived the goal of the action and helped the adult to fulfill his intention (Meltzoff, 1995). Hence, it seems that shared intentionality allows humans to take others' perspectives in terms of goal-directed behavior. Theories on how people come to understand others have been proposed in various academic fields. In developmental psychology, theory of mind attempts to explain how infants understand others through attributing cognitive processes to others (Premack & Woodruff, 1978). Similarly, the generalized "other" is a micro-sociological term describing how the interaction with a significant other is internalized and generalized, creating an inner compass for appropriate social behavior (Mead, 1934). In neurology, mirror neurons have been suggested as an important mechanism for understanding other people through imitation (Iacobini, 2009; Rizzolatti, Fadiga, Gallese, & Fogassi, 1996). Taken together, understanding and reproducing other people's behavior seems to be a unique and prominent aspect of human behavior. The research question in this thesis is, however, not *how* people are able to understand others, but how and when they *adjust* their behaviors to others. That is, this thesis examines behavioral conformity to normative information and how this conformity can be applied to intervention techniques promoting energy conservation.

The norm construct

Subtypes of social norms. As discussed earlier, social norms can be separated into injunctive norms, signaling other peoples' approval or disapproval (what other people think you should or should not do) and descriptive norms, signaling the prevalence of a specific behavior (what other people do). The motivational antecedents and processes driving conformity to social norms differ between the injunctive and descriptive norms, as conformity to injunctive norms seeks to fulfill the interpersonal goal of gaining social approval while conformity to the descriptive norm seeks to fulfill the intrapersonal goal of making accurate/effective decisions (Jacobson, Mortensen, & Cialdini, 2011; Jacobson, Mortensen, Jacobson, & Cialdini 2015). Similarly, research has found activation of the collective self to increase the persuasive impact of both injunctive and descriptive norms. Descriptive appeals were however particularly effective after activation of the individual self (White & Simpson, 2013). Moreover, the injunctive norm seems to demand more cognitive processing than the descriptive norm. For example, Jacobson et al. (2010) showed that induced self-regulation increases conformity to injunctive norms while impaired self-regulation increases conformity to descriptive norms. Similarly, Melnyk, van Herpen, Fischer, & van Trijp (2011) found cognitive deliberation to increase the impact of descriptive norms and decrease the impact of injunctive norms. According to the authors, this is because elaboration on the descriptive norm stimulates positive thinking about the behavior, while elaboration on the injunctive norm emphasizes external pressure which may lead to resistance.

Injunctive and descriptive norms have both been found to explain unique variances of intention and behavior (e.g., Armitage & Conner, 2001; Manning, 2009), and combining these norm components promotes intentions (Smith, Louis, Terry, Greenaway, Clarke, & Chen, 2012) and behaviors (e.g., Cialdini et al., 1990) more strongly. In a series of field experiments, Cialdini et al. (1990) used different techniques to activate (anti-) litter norms. In one experiment, a confederate's littering behavior was used to activate the (anti-) littering norm operationalized by either a clean or a littered environment. Results showed that norm activation increased the influence of the descriptive norm. That is, people were more likely to act upon others peoples littering behavior (or other anti-littering behavior) after the (anti-)

litter norm was made salient by the confederate. Cialdini et al. (1990) also showed that the social norm may be activated through the level of proximity between a text on a handbill (i.e. “do not litter”, vs. “recycle” vs. “lights out”, vs. “vote”) and the targeted behavior (littering). Yet another technique to make the norm salient was to place a single piece of litter in an otherwise clean environment, drawing participants’ attention to the anti-litter norm. In an applied demonstration of the FTNC, Schultz et al. (2007) found that low-energy-consumer households provided with both injunctive and descriptive norms used less energy than when provided with a descriptive norm only. This finding was explained by a prevented boomerang effect. That is, low energy consumption households provided with a descriptive norm continued to use little energy when also told that low energy consumption was approved (i.e., the injunctive norm)². The injunctive and descriptive norm constructs can be stated as either being in conflict (i.e., others do not do what is approved, or they do things that are disapproved), or aligned (i.e., others do what is approved or do not do what is disapproved). Compared with norms in conflict, aligned norms have shown to increase conformity in both experimental (Smith et al., 2012) and field settings (Cialdini, Demaine, Sagarin, Barrett, Rhoads, & Winter, 2006; see Cialdini, 2003, for a discussion). As a further conceptual distinction, an injunctive norm may be either *prescriptive*, encouraging desirable actions by using statements such as should, must, or ought, or *proscriptive*, discouraging undesirable actions by using statements such as should not, must not, or ought not (Cialdini, 2003; Manning, 2009). In the third article in the thesis (Bergquist & Nilsson, 2017), we propose a similar conceptual separation of the descriptive norm: the descriptive do-norm, informing what other people do, and the descriptive don’t-norm, informing what other people do not do.

Channel

Social norms may be communicated explicitly via feedback (Schultz et al., 2015) and prompts (Bator et al., 2014) or implicitly via the behavior of others (Cialdini et al., 1990; Keizer, Lindenberg, & Steg, 2013). Therefore, the PNI includes the two channels through which normative information may be communicated.

Explicit norms. Studies providing explicit normative information have used for example prompts and computerized feedback to communicate other peoples’ behavior. A field experiment found that more participants took the stairs when a norm-based prompt was used (“Did you know? More than 90 percent of the time, people in this building use the stairs instead of the elevator. Why not you?”) than when a health-based prompt was used (“Did you know? Taking the stairs instead of the elevator is a good way to get some exercise. Why not try it?”) (Burger & Shelton, 2011). In line with these findings, Goldstein et al. (2008, pp. 474) used prompts with either pro-environmental information (“Help save the environment...”) or normative information (“Almost 75% of [our] guests... use their towel more than once”) to promote reuse of hotel towels. Results, which have been successfully replicated, showed that normative prompts led to more reuse than prompts alluding to environmental concerns (Reese et al., 2013; see also Scheibehenne, Jamil, & Wagenmakers, 2016 for review).

Implicit norms. Implicit norms such as implied descriptive norms (Bator et al., 2014) and situational norms (Aarts, Dijksterhuis, & Custer, 2003) affect behavior through situational

² It could be argued that providing a descriptive norm did in fact promote conformity. However, for low-energy-consumer households, conformity (movement towards the groups’ behavior) increased energy usage.

cues. For example, field experiments have shown that if the lights are turned off when they enter a public bathroom, people are more likely to turn off the lights when leaving than if the lights were on when they entered (Dwyer et al., 2015; Oceja & Berenguer, 2009). Bator et al. (2014) found a similar effect, showing that more students turned off their computer in a campus computer room if the computers were turned off when they started to use them. From a social norms perspective these results are explained by that the initial status of the lights and the computers signaling what other people had done. The distinction between explicit and implicit channels of communicating social norms raises questions about motivational aspects of conformity to social norms. For example, what motivates people to conform to explicit norms versus implicit social norms? And is conformity to social norms always mediated by conscious processing?

Motivation

PNI includes two motivational antecedents to conformity: gaining others' approval and acting appropriately (Deutsch & Gerard, 1955)³. These motivators are enclosed in parentheses in PNI, suggesting that motivational aspects of conformity may bypass conscious processing (Aarts & Dijksterhuis, 2003). Interestingly, Dijksterhuis and Bargh (2001) suggest that non-conscious imitation is driven by evolutionary functional mechanisms that promote survival and gaining others' approval. Hence, they propose motivational antecedents similar to those proposed by Deutsch and Gerard (1955), but from an evolutionary perspective.

Appropriate and accurate behavior. The injunctive and descriptive norms may correspond to different motivational bases. Conformity to descriptive norms has been described as informational conformity, hence using others' actions as information about accurate behavior. The injunctive norm, on the other hand, may motivate conformity by gaining other people's approval by doing what is approved or by avoiding what is disapproved (Cialdini et al., 1990; Deutsch & Gerard, 1955). The motivational bases for the subtypes of injunctive norms may also differ, because prescriptive norms corresponds to "doing good," while proscriptive norms correspond to "avoiding bad" (Törnblom & Biddle, 1979; Winter et al., 2000).

Automaticity. As noted above, conformity to social norms may bypass conscious processing. For example, in a demonstration of the chameleon effect, it has been shown that people mimic a stranger shaking her foot or rubbing her face without taking conscious notice of these actions (Chartrand & Bargh, 1999). Similarly, in a common pools dilemma, priming cooperation or explicitly instructing participants to cooperate caused an increase in cooperative behaviors. Interestingly, the cooperative response seemed to be performed without mediated intent in the primed condition (Bargh et al., 2001). In line with this idea, there is some evidence suggesting that situational norms can promote non-conscious conformity (Aarts & Dijksterhuis, 2003). Studies have also found that conformity can be increased when people are primed with ideas and images such as religious concepts (Saroglou, Corneille, & van Cappellen, 2009) or a category strongly associated with conformity (Pendry & Carrick, 2001). Building on research showing an intimate link between perception and behavior (e.g., Rizzolatti & Arbib, 1998), Dijksterhuis and Bargh (2001) suggest that mere perceptions activate the same mental representations as a corresponding

³ Based on more recent research, it could also be argued that conformity can be motivated by a wish to avoid social exclusion (Eisenberger, Lieberman, & Williams, 2003; Zhong & Leonardelli, 2008).

behavior. It could therefore be argued that conformity is based on a “perception-behavior expressway,” suggesting that merely perceiving others behaviors will result in corresponding behavioral responses (see also Bargh, 2006 for discussion). Research on social norms has found that normative influence is often underestimated (Cialdini, 2005; Nolan et al., 2008; Göckeritz, Schultz, Rendón, Cialdini, Goldstein, & Griskevicius, 2010). However, this does not imply that conformity to social norm is a direct imitation of observable behaviors. Dijsterhuis, Smith, van Baaren, and Wigboldus (2005) distinguish between two forms of imitations: low-road, which refers to simple imitations such as gesture mimicry (e.g., Chartrand & Bargh, 1999) and the more complex high-road imitation, where imitation is based on inferences about other peoples’ goals. Cialdini et al. (1991) tested a social imitations model versus a social norms model by using a confederate who littered in either a clean or a littered environment. The social imitation model predicts that participants will imitate the confederate and litter independent of the environmental condition. In contrast, based on the social norms model, Cialdini et al. (1991) predicted and found that littering was moderated by the environment. Hence, participants did not simply imitate the confederate’s behavior, but seemed to be prompted about the environment by the confederate’s behavior and then infer the adaptive social behavior from that environment.

Goal priming. According to GFT, environmental cues may activate goals that frame information processing and consequently lead to corresponding behaviors. In line with these postulates, the unconscious behavior guidance system (UBGS; Bargh & Morsella, 2008) predicts that goals should trigger corresponding behaviors outside conscious awareness. These findings suggest that goals can affect behavior implicitly, activated through environmental cues and pursued without conscious awareness (see Fishbach & Dhar, 2007, for a discussion). One important question here is whether both steps (the environmental cue affecting the mediational system and the mediational system affecting behavior) of goal priming are automatic. UBGS seems to predict that the whole mediational chain is automatic, while in GFT the first step is automatic while the second step may be conscious as people’s actions in a given situation are based on focal beliefs and motivations (Lindenberg & Steg, 2013). For example, framing a prisoner’s dilemma game as a “Wall Street Game” led participants to *expect* others to defect, whereas a “Community Game” led to expectations of cooperation (Lieberman, Samuels, & Ross, 2004), indicating that such framing (or priming) affects behavior by changing peoples’ beliefs. Taken together, there is some support for the idea that goals affect behavior without conscious awareness, but goals may also create conscious motivation, making people act in terms of hedonism, gain, or normative considerations (Lindenberg, 2000).

Internalized motivation for conformity. Another aspect of motivation to conform is the level of internalization. Festinger (1953) proposed a conceptual distinction between public compliance *with* private acceptance versus public compliance *without* private acceptance. Public conformity without private acceptance is the result of an induced force. The induced force may, however, become an own force, making the response one of public conformity with private acceptance. Festinger defined public conformity with private acceptance as a situation in which people desire to remain with those attempting to influence them. Conversely, in public conformity without private acceptance, the person is restrained from leaving the situation by sanctions for nonconformity (see also Kelman, 1958). Similarly, Thøgersen (2006) proposed levels of internalization of norms. In a norm taxonomy, the

motivational basis for descriptive norms is described as most external, suggesting that conformity is motivated by acting adaptively. Injunctive norms are less externally motivated, affecting behavior based on people's beliefs about what other people think one should or should not do. Finally, personal norms are separated into the superficially internalized introjected norm, motivated by anticipated guilt or pride, and the most internalized integrated norms, motivated by one's self-concept rather than guilt or ego enhancement. For introjected and integrated norms, conformity is a self-expectation, motivated by "feelings of obligation," where (dis)engagement in a specific behavior is perceived as "wrong" or "right" on its own. Thøgersen's norm taxonomy emphasizes the locus of motivation when conforming to normative influence. From the norm taxonomy, personal norms could be seen as an internal force, an intrinsic motivator characterized by public conformity with private acceptance. A number of studies have supported a positive relationship between personal norms and intentions and actual behavior in various pro-environmental actions (e.g., Bamberg & Möser, 2007; Fornara, Pattitoni, Mura, & Strazzera, 2016; Nordlund & Garvill, 2002, 2003; Steg, Dreijerink, & Abrahamse, 2005; Thøgersen, 2006; Van der Werff & Steg, 2015).

Response

Conformity versus compliance. Normative behavioral adjustments have up to this point been defined as conformity. However, a separation between two types of responses to normative influence can be made. Conformity is behavioral adjustment to other people, while compliance is acquiescence to a request (Cialdini & Goldstein, 2004). Using these definitions, the difference between conformity and compliance could be explained by whether the normative information is framed as a request or not. Following this definition Goldstein et al. (2008, pp. 474) examined compliance in a study where hotel guests were asked to "... reuse your towel during your stay." Other studies have examined conformity by merely informing people about others' behavior without any explicit request (Smith et al., 2012; Dwyer et al., 2015) or by providing the behavioral tracks of others (Cialdini et al., 1990; Keizer et al., 2008, 2013). However, the difference between conformity and compliance is not always clear. For example, some studies include both information about other people's behavior and a request (Bator et al., 2014; Oceja & Berenguer, 2009), while others first provide information about the desired behavior, and then also provide normative information (Kormos et al., 2014; Schultz et al., 2015). As suggested by the two rows in PNI, compliance may primarily be motivated by a wish to gain other peoples' approval, while conformity may primarily be motivated by a wish to act correctly.

Non-targeted response. Another aspect of response to social normative information is how broad or narrow the response is. That is, will normative information about the specific pro-environmental actions energy conservation affect only that behavior (a narrow response) or also other types of pro-environmental behavior (a broad response). For example, observing generous donations has been shown to promote writing more supportive messages (Nook, Ong, Morelli, Mitchell, & Zaki, 2016). Nook et al. (2016) describes the narrow response as imitation and the broader response as based on deeper goals or motives. Similarly, research on goal-framing has found that both disobedience and cooperation spread across behavioral domains (Keizer et al., 2008, 2013). We therefore propose that the question of positive (and negative) spillover effects, is important to consider when assessing normative influence.

In sum, PNI integrates components of normative influence, and provides a framework for how and when normative information can affect behaviors. Since only a few frameworks of normative influence have been proposed (e.g., Rimal & Real, 2005), PNI may contribute to discussions about normative influence. However, it should be noted that PNI should not be seen as a complete model. Rather, the model could be extended to include additional factors affecting normative influence. For example, characteristics of the individual, such as values (Nordlund & Garvill, 2003; Schwartz, 1977; Stern, 2000) and social comparison orientation (Litt, Lewis, Stahlbrandt, Firth, & Neighbors, 2012; Novak & Crawford, 2001), and characteristics of the reference group, such as identification (Terry, Hogg, & White, 1999), group size (von Borgstede, Dahlstrand, & Biel, 1999), and proximity (Bergquist & Nilsson, 2017^b).

Aim of the present thesis

Since Cialdini et al. (1991) refined the theoretical basis and demonstrations of the behavioral implications of social norms, a number of studies have used social norms to promote pro-environmental behaviors (e.g., Goldstein et al., 2008; Schultz, 1999, Schultz et al., 2007). Building on these studies, the aim of this thesis is to investigate the promotion of energy conservation behavior by evaluating and developing pro-environmental interventions based on social norms. First, based on predictions derived from GFT, in Studies I and II we compared the behavioral and psychological effects of contest-based and norm-based intervention techniques. Second, in Studies III and IV we examined the influential power of separate and combined components of social norms. More specifically, Study III introduced and tested a new conceptual separation: the descriptive do-norm and the descriptive don't-norm. Study IV tested if combinations of prescriptive and proscriptive injunctive norms could promote normative influence.

SUMMARY OF EMPIRICAL PAPERS

Through four studies, comprising nine experiments, the present thesis examines the psychological and behavioral effects of normative information to promote energy conservation (and sustainable consumption). The empirical studies, including method, number of subjects, conditions, independent variables, and dependent variables are summarized in Table 1.

Table 1. Overview of empirical studies included in the thesis.

Study	Method	<i>n</i>	<i>k</i>	Independent variables	Dependent variables
Ia	Online experiment	114	2	Gain vs. normative goal-framing (contest vs. norms)	Behavior, personal norms, and behavioral intentions
Ib	Online experiment	233	2	Gain vs. normative goal-framing (contest vs. norms)	Behavior and personal norms
IIa	Field experiment	19	2	Gain vs. normative goal-framing (contest vs. norms)	Behavior, attitudes, and personal norms
IIb	Field experiment	206	3	Gain vs. normative goal-framing (contest vs. norms vs. control)	Behavior, attitudes, personal norms, and spillovers
IIIa	Laboratory experiment	118	3	Descriptive norms (do vs. don't vs. control)	Choice
IIIb	Online experiment	362	3	Descriptive norms (do vs. don't vs. control)	Choice
IIIc	Online experiment	336	4	Descriptive norms (do vs. don't vs. control × accept vs. reject)	Choice
IVa	Field experiment	384	6	Injunctive norms (single vs. dual injunctive norms)	Behavior
IVb	Online experiment	185	4	Injunctive norms (single and dual injunctive norms)	Emotional response, reactance, and choice

Note. *n* = participants, *k* = conditions.

Study I

The aim of Study I was to compare behavioral and psychological responses to contest-based versus norm-based intervention techniques targeting energy conservation and recycling. Based on GFT, it was proposed that the contest-based intervention technique is a form of gain goal frame, making people perceive the targeted activity in terms of maximizing one's profit (Lindenberg, 2000, 2001; Lindenberg & Steg, 2007, 2013; Steg et al., 2016). When using a norm-based intervention technique, it was proposed that a normative goal would frame, making people perceive the targeted behavior in terms of moral obligations and "oughtness." Therefore, it was hypothesized that participants would show an instrumental and intensive behavioral response in the contest-based intervention technique, because behavioral engagement is framed as a means to increase participants' economic outcome. For the norm-based intervention technique, framing normative considerations, it was hypothesized that personal norms would be activated for targeted and non-targeted pro-environmental behaviors. Furthermore, the norm-based intervention technique was expected to motivate people to engage in the targeted behavior in the future.

Study I: Experiment 1

Background. The aim of Experiment 1 was to test whether engagement in a contest-based versus norm-based intervention technique promoting energy conservation affects behavioral engagement, personal norms, and intentions to engage in energy conservation in the future. In a between-subjects design, participants were provided with information on energy saving, and asked to write as many energy-saving tips as possible. Half the participants were told that the task was a contest, while the other half were provided with injunctive normative information about energy conservation. Based on GFT, it was first hypothesized (H1) that participants in the contest-based intervention technique would write more energy-saving tips than participants in the norm-based intervention technique. Participants in the norm condition were also expected to express both stronger personal energy-saving norms (H2a) and stronger intentions for future energy conservation (H2b) than participants in the contest condition. Because personal norm is a relatively stable construct, we hypothesized that personal norms would positively correlate with number of energy-saving tips written (H3a) and intention for future energy conservation (H3b). Based on our expectation that the norm-based intervention would activate a normative goal, while the contest-based intervention would push away the normative goal (as a consequence of framing the gain goal), we hypothesized two moderations resulting in stronger correlations between personal norms and number of energy-saving tips (H4a) and personal norms and intention for future energy conservation (H4b) in the norm-based than in the contest-based intervention technique.

Method. One hundred and fifty participants in the USA were recruited through Amazon's Mechanical Turk (MTurk). Using Qualtrics, participants were randomly assigned to a contest condition or a norm condition. All participants were provided with energy conservation material and were asked to write as many energy-saving tips as possible using 30 empty rows. In the norm condition, participants were provided with an injunctive norm through a graph and a text stating that approximately "90% of American MTurkers" rated energy conservation

as good⁴. In the contest condition, participants were informed that writing energy-saving tips was a contest, and were shown how the prize money accumulated with each written tip. Participants in both conditions were provided with the information that “Other Mturkers write seven tips on average.” We believed that this information would be interpreted as a descriptive norm for participants in the norm condition, while participants in the contest condition would interpret this information as a reference point that must be outmatched to win the prize. After writing energy-saving tips, participants in both conditions rated personal energy conservation norms and intentions for future energy conservation. Finally, in order to control for a possible difference in activation of the hedonic goal frame, participants answered five items measuring hedonic values, based on Schwarz (1992).

Results and Discussion. First, in line with H1, data showed that participants in the contest-based intervention technique wrote more energy-saving tips than participants in the norm-based intervention technique, suggesting that the contest stimulated more intensive behavioral engagement. Although the results were in the predicted direction, hypothesis H2a was not supported. In line with H2b, participants in the norm-based intervention technique reported a tendency for stronger intentions for future energy conservation. Two hierarchical regression analyses supported both hypotheses H3a and H3b in showing positive relations between personal norms and both number of energy-saving tips written and intentions for future energy conservation. However, these relationships were not moderated by intervention techniques, failing to support H4a and H4b.

In brief, although results were in line with our predictions, we did not confirm that the norm-based intervention activated stronger personal norms than the contest-based intervention. However, Experiment 1 found that the contest-based intervention technique promoted more intensive behavioral engagement, while the norm-based intervention tended to elicit stronger intentions for future energy conservation. Taken together, these results suggest that a contest-based intervention technique promotes a gain goal, while a norm-based intervention technique promoted a normative goal. Therefore, participants in the contest-based intervention technique engaged more intensively in the targeted activity. Such an increased engagement might also be found in actual energy conservation, but then it would be expected to last only for as long as engagement is associated with a possible increase in resources (i.e., the chance to win the contest).

In line with a normative goal frame, participants in the norm-based intervention technique tended to report stronger intentions for future energy conservation. This indicates that the norm-based intervention technique may have a more long-termed effect than the contest. We did not confirm that such possible long-term effect was driven by activation of personal norms. Experiment 1 was limited in at least two respects: (1) contest-based and norm-based intervention techniques were compared between groups that differed in number of energy-saving tips written (i.e., different level of engagement), and (2) monetary incentives were confounded with the operationalization of the contest. The lack of support for activation of personal norms in the norm-based intervention may be because participants in this condition did not engage in the targeted behavior sufficiently. To address these limitations, and to further examine the behavioral and psychological effects of contest-based versus norm-based intervention techniques, we conducted Experiment 2.

⁴ The normative information was based on MTurk data from our pre-studies.

Study I: Experiment 2

Background. Experiment 2 had a between-subjects design including a fictive recycling task, where fast performance was associated with individual gain in the contest condition. To reduce the potential impact of monetary incentives as a confounder in the contest condition, Experiment 2 provided participants with points instead of cumulative prize money in the contest condition. Moreover, both to improve causal inferences and to make participants engage equally in the targeted behavior, all participants performed the targeted behavior (fictive recycling) 50 times. First, because faster performance was associated with higher probability of winning, participants in the contest-based intervention was expected to perform the task faster (H5) and make more errors (H6), than participants in the norm-based intervention. Second, because normative goal-framing was expected to increase feelings of moral obligation and oughtness of pro-environmental behavior (Lindenberg & Steg, 2007, 2013; Steg et al., 2016), and because normative framing may not be restricted to the targeted behavior (Bolderdijk & Steg, 2015; Steinhorst et al., 2015), we hypothesized that compared with participants in the contest condition, participants in the norm condition would show stronger personal norms for non-targeted pro-environmental behaviors (pro-environmental policy acceptance [H7] and energy conservation [H8]).

Method. We recruited 233 participants in the USA were through MTurk. Using Qualtrics, participants were randomly assigned to a contest condition or a norm condition. In a recycling task, all participants were asked to drag and drop 50 pictures of various household waste to the correct recycling category (*paper, glass, steel/aluminum, and plastic*). In the norm condition, participants were provided with an injunctive norm through a graph and a text stating that approximately 90% of “American MTurkers” rated recycling as good⁵. Participants were also shown a picture of individuals engaging in cooperation or competition including a text describing recycling as either sustainable or as a means to win a price, depending on condition. After recycling the 50 items, participants in both conditions rated personal norms for accepting pro-environmental policies and personal energy conservation norms.

Results and Discussion. Before conducting the main analysis, a manipulation check confirmed that participants in the contest condition perceived the recycling task as more competitive, while participants in the norm condition perceived the task as more cooperative. In line with H5 and H6, participants in the contest performed the recycling task faster, but also tended to make more errors. Moreover, participants in the norm condition tended to show stronger personal norms for both pro-environmental and policy acceptance than those in the contest condition, partially supporting H7. Finally, in line with H8, participants in the norm condition also tended to show stronger personal energy conservation norms than participants in the contest condition.

Taken together, the results of the two experiments partially supported our proposition derived from GFT: the norm-based intervention technique framed a normative goal, while the contest-based intervention framed a gain goal. These findings indicate that the contest-based intervention technique has the ability to promote intensive behavioral engagement, while the norm-based intervention technique has the ability to promote a personal obligation to pro-

⁵ This graph was based on data from a pre-study where attitudes on energy conservation were assessed using an MTurk sample.

environmental actions, which was strongly associated with intentions for future behavioral engagement and may provide a basis for positive spillover effects.

Study II

The aim of Study II was to further examine contest-based versus norm-based intervention techniques by testing actual electricity usage, attitudes, norms, and spillover effects in two field experiments.

Study II: Experiment 1

Background. The aim of Experiment 1 was to compare attitudes, norms, and actual electricity usage in a quasi-experimental field experiments. Based on GFT we predicted that participants in the contest-based intervention condition would show more intensive but shorter-lived electricity saving than participants in the norm-based intervention condition (H1). Participants in the norm-based intervention condition were predicted to show less intensive but more long-lasting electricity saving behavior than participants in the contest-based intervention condition (H2). Only participants in the norm-based intervention condition were predicted to show an increase in personal electricity conservation norms (H3) and an increase in positive electricity conservation attitudes (H4).

Method. We invited residents of 150 student households in Gothenburg, Sweden, who payed for their electricity usage, to participate in an energy conservation study. The student households were in two separate, identical building blocks. Participants were recruited via door hangers informing all individuals about the study and saying that all participants would receive a lottery ticket and a refrigerator magnet with electricity saving tips. All participants signed consent for access to their electricity data and received both a pre- and a post-intervention survey. The survey measured both attitudes and energy conservation norms. We randomly assigned the building blocks to either a contest-based or a norm-based intervention. During the intervention, contest-based or norm-based information was provided to participants via posters, a refrigerator magnet, and an e-mail. The final sample included 19 participants ($n_{\text{contest}} = 11$).

Results and Discussion. Electricity conservation in the contest condition was best described by a quadratic trend. Hence, supporting H1 in showing that electricity conservation was intensive but shorter-lived in the contest-based intervention. For the norm condition, data was best described by a linear trend, supporting our prediction that participants in the norm-based intervention would show less intensive and longer-lasting electricity saving than participants in the contest-based intervention (see Figure 3). Energy conservation norms showed a nonsignificant main effect and a nonsignificant interaction effect, while attitudes showed a marginally significant interaction. In line with H4, simple effects showed a significant increase in attitudes in the norm condition but not in the contest condition.

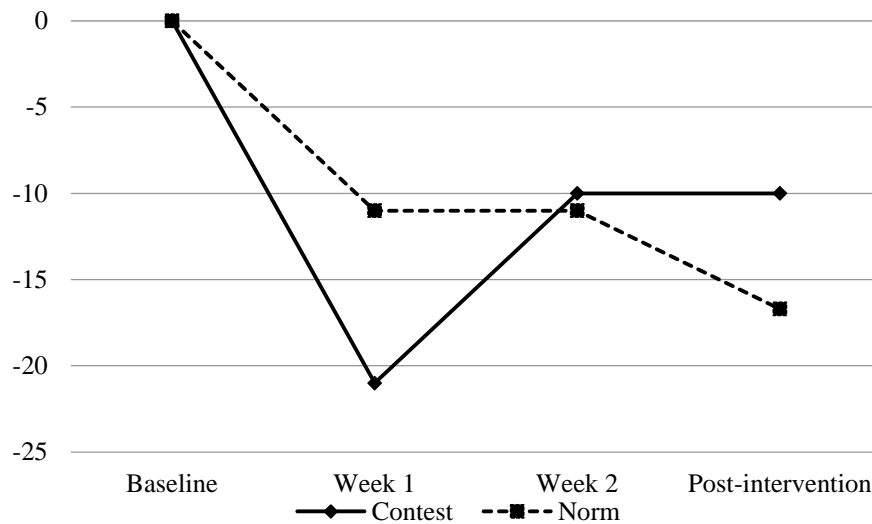


Figure 3. Percentage changes in kWh use from baseline to the first and second week of the intervention and during the post-intervention period for the contest-based and norm-based interventions.

Study II Experiment 1 conceptually replicated our findings from Study I using kWh-data. We found that participants assigned to a contest-based intervention engaged more intensively in actual energy conservation, but that the effect was only short-term. Also in line with our predictions, electricity conservation in the norm-based intervention was less intensive and longer lasting. Our prediction that only participants in the norm-based intervention would report an increase in personal energy conservation norms was not supported. However, H4 was supported in that only participants in the norm-based intervention reported increased energy conservation attitudes. Taken together, Study II Experiment 1 generally supports our predictions derived from GFT, indicating that contest-based intervention is a form of gain goal frame while the norm-based intervention is a form of normative goal frame, resulting in both behavioral and psychological differences.

Study II: Experiment 2

Background. Because the number of participants recruited to Experiment 1 was small, we conducted a second experiment once again testing Hypotheses 1–4. We also tested two hypothesizes (H5a and H5b) predicting a positive relationship between energy conservation and the non-targeted pro-environmental behaviors, recycling and water conservation, only in the norm-based intervention.

Method. Residents of 780 student households in Umeå, Sweden, that payed for their electricity usage were offered the opportunity to participate in an energy conservation study using the same procedure as in Experiment 1. We also included a control group separated in two buildings. The final sample included 206 households ($n_{\text{control}} = 146$, $n_{\text{contest}} = 30$, $n_{\text{norm}} = 30$). Participants also answered three surveys: one before the intervention started, a second after the intervention, and a third follow-up survey.

Results and Discussion. Results supported H1 in showing that participants in the contest condition used significantly less electricity during the first half of the intervention, best

described by a quadratic trend. Hence, we replicated the results of Experiment 1, once again showing that the contest induced intensive but short-lived electricity savings. Participants in the norm condition did not save more electricity than participants in the control condition either during the intervention or in the post-intervention period. H2 was therefore not supported. 48 individuals completed all three surveys and were therefore used to test hypotheses 3–5. Results showed no effect on personal electricity conservation norms, failing to support H3. When assessing attitudes toward electricity conservation, results revealed an unpredicted significant main effect showing that only for participants in the contest condition were attitudes stronger during the intervention than to prior to the intervention and after the intervention. These results were not predicted by H4. A moderation model using the software *Process* in *SPSS* found that increased kWh conservation was positively related with increased self-reported water conservation only in the norm-based intervention. Although H5a was not supported, these data confirm H5b, indicating a positive spillover effect between electricity and water conservation only in the norm-based intervention.

Taken together, Study II aimed to conceptually replicate and further investigate the findings of Study I. Using kWh data in two field experiments we consistently found that electricity conservation was intensive yet short-lived in the contest-based intervention. In contrast, a smaller, but longer lasting effect of electricity conservation was supported in Experiment 1, but not replicated in Experiment 2.

A practical implication of these data is that contest-based intervention may be preferred if the goal of the intervention is to promote fast and intensive behavioral change. Moreover, these data also stress the importance of evaluating norm-based interventions. Studies I and II suggest that the norm-based intervention may affect both behavioral antecedents and behavior.

Study III

The aim of Study III was to assess a new conceptual separation of the descriptive social norm: the descriptive do-norm and the descriptive don't-norm. Past research suggests that people conform to descriptive norms to follow others' behavior (e.g., Cialdini et al., 1991). We propose that descriptive norms can also promote conformity motivated by a wish to avoid what others do not do.

Study III: Experiment 1

Background. Because bad is generally stronger than good (Baumeister et al., 2001), as demonstrated, for example, in loss aversion (Kahneman & Tversky, 1979) and negativity bias (Rozin & Royzman, 2001), we predicted that people would be more sensitive to others' avoidance (don't-norms) than approach tendencies (do-norms).

Method. One hundred and eighteen participants (68.5% female and 26.9% male, $M_{\text{age}} = 28.37$, $SD = 10.27$, Range = 18-77) were recruited from the participant pool at the Department of Psychology, University of Gothenburg. In a consumer choice task all participants were given a fictive budget of 155 SEK and asked to choose between pairs of products in three sets. All three choices were between low priced "non-sustainable" products and more expensive sustainable products. The software *Qualtrics* randomized participants to one of three conditions: do-norm, don't-norm, and control condition. Both the do-norm and the don't-norm included descriptive normative information only in the third choice task (choosing

between an energy efficient light bulb and a conventional light bulb). The normative information promoted the energy efficient choice and was framed as what other people do in the do-norm (“other people buy this [the energy efficient] light bulb”), while participants in the don’t-norm condition received this information framed as what other people did not do (“other people avoid buying this [the low price] light bulb”). Participants in the control condition did not receive information about others’ choices. As a dependent variable, we assessed the number of participants choosing the energy efficient light bulb.

Results and Discussion. A planned comparison chi-square analysis first compared a combined norm condition (both do-norm and don’t-norm) to the control condition. Results failed to support H1 by showing that the number of people choosing the energy efficient light bulb did not differ significantly between the conditions. Although not significant, a second chi-square analysis found that conformity was 15.2% higher in the don’t-norm condition (67.6%) than in the do-norm condition (52.4%). Plausibly due to low power and demand characteristics (inflating the environmentally friendly choice in the control condition) we could not support our hypotheses with statistical significance. However, the data indicated that the don’t-norm is stronger than the do-norm. Suggesting that the “bad is stronger than good” effect also holds within normative influence. To further assess our proposition, we conducted Experiment 2 using a larger size.

Study III: Experiment 2

Background. The aim of Experiment 2 was to conceptually replicate Experiment 1 in an experiment with a larger sample to increase power.

Method. Through MTurk, we recruited 362 individuals located in the USA who were paid 20 cents each for their participation. Similar to Experiment 1, participants were asked to choose between two food products. In a between-subject design, participants were presented with two products: a low-priced peanut butter (\$2) including the text “save money,” and a more expensive organic peanut butter (\$4) including the text “save the planet.” Participants were instructed to both “drag the jar you want to the upper box.” and “drag the jar you would avoid to the lower box.” Qualtrics randomly assigned participants to one of three conditions: the do-norm condition included a picture showing organic peanut butter combined with the text “other people want this jar!”, the don’t-norm condition showed a picture of the low-priced peanut butter combined with the text “other people avoid this jar!”, and the control condition providing no information about other people’s choices. As a dependent variable, we measured the number of participants choosing the organic product (and thus also rejecting the low price peanut butter) in each condition.

Results and Discussion. A planned comparison chi-square analysis first compared a combined norm condition (both do-norm and don’t-norm) to the control condition. Results supported H1 in showing that more participants in the norm condition (53.3%) chose the organic product than participants in the control condition (40.6%). Although not significant, a second chi-square analysis once again found that more participants in the don’t-norm (58.8%) chose the organic product compared to participants in the do-norm condition (48.8%). Although Experiment 2 recruited more participants to increase power, the difference between the do-norm and don’t-norm was not confirmed with conventional levels of significance. Still, data from Experiment 2 once again showed a descriptive trend in line with our proposition. A

possible moderator confounding the effect may be that people use different motives for accepting and for rejecting (Shafir, 1993, 2007). Experiment 3 explored the possibility that choice context (accepting vs. rejecting) may moderate the effect of do-norm and don't-norms.

Study III: Experiment 3

Background. The compatibility principle suggests that people choose for positive reasons and reject for negative reasons (Shafir, 1993, 2007). Because we attributed the tendency for the don't-norm to outperform the do-norm to asymmetrical decision preferences (e.g., loss-aversion), we predicted that the don't-norm would be stronger than the do-norm in both the accepting and rejecting condition. Furthermore, we tested whether the wording of the do-norms and don't-norms would affect the normative influence.

Method. We recruited 362 individuals in the USA from MTurk. Participants were paid 20 cents and randomly assigned to a 2 (norm: do-norm vs. don't-norm) \times 2 (choice: accept vs. reject) \times 2 (wording: preferred or unpreferred vs. want or avoid) between-subjects factorial design. Experiment 3 used the same basic stimulus material as Experiment 2, and again all participants were asked to choose between a low-priced and an organic peanut butter, using the normative information "other people want/unpreferred this bottle!", or "other people would avoid/ unpreferred this bottle!" depending on the condition. In contrast to Experiment 2, participants did not both accept and reject the two food products, but either chose or rejected one of the products. As the dependent variable we measured the number of participants choosing the organic product (or rejecting the low-priced product).

Results and Discussion. A GLM-model tested two main effects (norm and wording) and two two-way interactions (norm \times choice and norm \times wording). Wald chi-square first showed that the don't-norm (64.2%) promoted higher conformity than the do-norm (44.8%), now supporting our main hypothesis with statistical significance. Results did not support the norm \times choice interaction, failing to support our hypotheses that the don't-norm is stronger when rejecting while the do-norm is stronger when accepting. However, a simple slopes analysis showed that the difference between the do- and don't-norms reached statistical significance in the rejecting decision context, but did not reach significance in the accepting decision context (see Figure 4). Although the data showed the predicted pattern of increased conformity to the don't-norm in both the rejecting and accepting conditions, these results suggest that the influential power of don't-norms may be particularly effective in rejecting decision contexts. Second, a main effect of wording was found, showing that the want/avoid wording promoted higher conformity than the preferred/unpreferred wording. Nevertheless, the norm \times wording interaction was not significant. Data showed that the don't-norm promoted higher conformity than the do-norm both when worded as want/avoid (48.5% vs. 68.7%) and when worded as preferred/unpreferred (38.3% vs. 55.2%). Taken together, the three experiments consistently showed a tendency for more people to conform to the don't-norm than the do-norm. We suggest that this increased conformity demonstrates that the "bad is stronger than good effect" (Baumeister et al., 2001) also holds for normative influence.

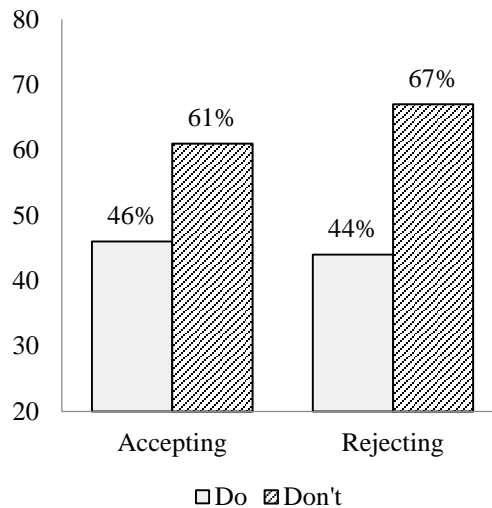


Figure 4. Percent choosing the organic product, or rejecting the low-priced product, as a function of type of descriptive do-norm or don't-norm across an accepting and a rejecting choice context.

Study IV

FTNC predicts that salience of the social norms will increase conformity (Cialdini et al., 1990). In a series of field experiments Cialdini et al. (1991) focused people's attention on descriptive or/and injunctive norms, which consequently promoted conformity. Study IV was based on FTNC, designing combinations of prescriptive and proscriptive norms in order to promote normative influence.

Study IV: Experiment 1

Background. Building on FTNC, we proposed an attention-reactance proposition to increase compliance. More specifically, we hypothesized that the proscriptive norm, operationalized as a negatively valenced stimulus, would attract attention (e.g., Hansen & Hansen, 1988), while the prescriptive norm would reduce the reactance elicited by the "forcing" proscriptive norm (Pennebaker & Sanders, 1976; Reich & Robertson, 1979). Due to the reactance effect (Brehm, 1966), it was hypothesized (H1) that the proscriptive prompt would generate lower compliance than the prescriptive prompt. Furthermore it was hypothesized (H2) that norms including both a prescription *and* a proscription would make more people comply than using exclusively prescriptive *or* proscriptive norms.

Method. We made 384 valid observations (71.8% females) of individuals turning off the lights or not after using one of two bathrooms in a Swedish campus library. In a quasi-experimental field experiment, four normative prompts were compared for their effects to promote energy conservation in public bathrooms. The prompts were developed in a 2 (picture: prescriptive vs. proscriptive) × 2 (text: prescriptive vs. proscriptive) design, generating two single-content prompts (including prescriptions or proscriptions) and two dual-content prompts (including both prescriptions and proscriptions). Before the prompts were introduced in the setting, observations were made to partially replicate the findings that prior light status affected

behavior (Dweyer et al., 2015; Oceja & Berenguer, 2009). Therefore, light status (on vs. off) was manipulated in the bathrooms and behavioral observations were made. The light off condition was used as a baseline (i.e., behavior excluding prompts) when comparing the four prompts.

Results and Discussion. First, we replicated past findings (Dwyer et al., 2015; Oceja & Berenguer, 2009) in showing that more people turned off the light when leaving if the lights were turned off when they entered (74.3%) than if the lights were turned on when entering (54%). This may be because the lights-off condition signaled an implied descriptive norm, showing that other people had turned off the lights when leaving the bathroom. Second, planned comparisons did not support H1. Third, in support of H2, prompts that included both prescriptive and proscriptive content (i.e., dual-injunctive) elicited higher compliance (88.1%) than prompts including either prescriptive or proscriptive content (i.e., single-injunctive) (78.6%). Compared to the control condition, the two prompts including dual-injunctive content increased turning off the lights by 10.2% and 17.7%, respectively. This has both theoretical and practical implications suggesting that combinations of injunctive norms can increase compliance, and that such combinations of injunctive norms could be applied to promote energy conservation. Experiment 1 did not test how the prompts were interpreted by participants. To examine this, we conducted a second experiment.

Study IV: Experiment 2

Based on FTNC, Experiment 1 proposed that an attention-reactance function would increase salience of normative information and decrease reactance, and thus, promote compliance. Results were in line with this prediction. Because negatively valenced stimuli have been found to attract more attention than positively valenced stimuli (e.g., Baumeister et al., 2001), we used an indirect measure of attention through measuring perceived positive-negative emotions elicited by the prompts. We predicted two main effects of perceived negative emotions. Both proscriptive picture (H1) and proscriptive text (H2) was predicted to show higher ratings of negative emotions, indicating that proscriptions attract more attention than prescriptions in both picture and text. Based on the Questionnaire for Measuring Psychological Reactance (QMPR; Donnell, Thomas, & Buboltz, 2001), a three-factor structure was used to develop three items for measuring rated reactance to the four prompts. We predicted that both proscriptive picture (H3) and proscriptive text (H4) would show higher levels of rated reactance than a prescriptive picture and a prescriptive text, respectively. Finally, since prescriptive anti-litter signs have been found to be preferred over proscriptive anti-litter signs (Winter et al., 2000), we hypothesized (H5) that participants would rate the single-injunctive prescriptive prompts as the most effective prompts for promoting energy conservation.

Method. In a repeated measures design, 185 respondents (75.7% females, age 18–54 years, $M = 24.84$, $SD = 5.77$), recruited from the participant pool at the Department of Psychology, University of Gothenburg, were randomly presented with all four prompts used in Experiment 1 in an online survey. We measured participants' emotional response and rated reactance to all four prompts. In addition, to examine participants' perceived efficiency of the four prompts we asked "Suppose you want to encourage as many people as possible to turn off the lights when leaving a public bathroom. Which of the following signs would you use?"

Results and Discussion. Two 2 (picture: prescriptive vs. proscriptive) \times 2 (text: prescriptive vs. proscriptive) repeated measures ANOVAs were conducted on ratings of emotional reaction and reactance. In line with H1, results of ratings of emotional reactions showed a main effect of picture. However, no significant difference of text was found, and therefore H2 was not supported. Results of ratings of reactance showed a main effect of picture, and a main effect of text, supporting both H3 and H4. Finally, it was found that 80.5% of the participants preferred the single-injunctive prescriptive prompt, supporting H5. Taken together, these findings add to the FTNC by suggesting that combinations of prescriptive and proscriptive norms can be used to promote conformity, operationalized an energy conservation behavior. Moreover, the results also showed that the prompt preferred by 80.5% of our sample was the least effective prompt in promoting energy conservation behavior in our field experiment, emphasizing the importance of theory-based intervention techniques.

GENERAL DISCUSSION

The aim of this thesis was to apply and develop social normative information in order to investigate intervention techniques targeting energy conservation. Study I and II compared behavioral and psychological effects of contest-based and norm-based intervention techniques. Study III and IV examined if and how new conceptualizations of social norms can increase pro-environmental choice and behaviors.

Results from Study I were generally in line with our proposition that the contest-based intervention technique promote a gain goal, while a norm-based intervention technique promote a normative goal. In Experiment 1, participants in the contest showed intensive engagement in the targeted activity: writing almost twice as many energy-saving tips as participants assigned to the norm-based intervention technique. Experiment 2 found that participants in the contest-based intervention technique worked faster and made more errors in a fictive recycling task, once again suggesting that these participants acted upon a gain goal frame. Furthermore, marginal support was found for the norm-based interventions to increase intentions for future energy conservation and personal norms for non-targeted behavior (energy conservation and acceptance of pro-environmental policies). Taken together, in line with hypotheses derived from GFT (Lindenberg & Steg, 2007), two experiments suggest that participants in the contest-based intervention were motivated to improve their resources while participants in the norm-based intervention were motivated to act upon obligations.

Study II aimed to further examine the contest-based versus the norm-based intervention techniques in two new field experiments. In both experiments we measured participants' kWh-usage before, during, and after the intervention. Both field experiments also used pre- and post-intervention surveys assessing for example personal electricity conservation norms and attitudes toward electricity conservation. Both experiments found that electricity conservation was best described by a quadratic trend for participants assigned to the contest-based intervention, thus supporting our prediction that electricity conservation was intensive but short-lived in the contest. In Experiment 1, electricity conservation for participants in the norm condition was best described by a negative linear trend, supporting our prediction that participants' in the norm-based intervention showed less intensive and longer-lasting electricity saving than participants in the contest-based intervention. This result, however, was not replicated in Experiment 2, nor was our prediction that the norm-based intervention would strengthen personal norms for electricity conservation supported. Experiment 1 furthermore showed that attitudes toward electricity conservation increased only for participants in the norm-based intervention. However, Experiment 2 did not replicate this finding, but showed that attitudes increased only for participants assigned to the contest-based intervention. In addition to Experiment 1, Experiment 2 assessed effects on non-targeted behaviors. In line with the results of Study I, electricity conservation was found to be positively correlated with water conservation only for participants in the norm-based intervention. This indicates that the two interventions may differ in terms of spillover effects. However, the hypothesis about the activation of personal norms in norm-based interventions was rejected in 3 of the 4 experiments, which calls for a reconsideration of the role of personal norms in norm-based interventions.

Study III tested a new conceptualization of the descriptive norm by separating the descriptive norm into a descriptive do-norm (informing what other people do) and a descriptive don't-

norm (informing what other people do not do). In one laboratory experiment and two online experiments participants were asked to choose between conventional and environmentally friendly products. Although not statistically significant, the results from Experiment 1 found that 15.2% more participants made the environmental friendly choice in the don't-norm condition (67.6%) than in the do-norm condition (52.4%). In a conceptual replication with increased power, Experiment 2 once again indicated that the environmentally friendly choice was made more often (10%) when exposing participants to a don't-norm (58.8%) than to a do-norm (48.8%). Finally, using the same basic experimental design as Experiment 2, but adding a control for choice context (participants either chose or rejected the alternatives). Experiment 3 supported that the don't-norm (64.2%) promoted higher conformity than the do-norm (44.8%). Taken together, these three experiments consistently found that the descriptive don't-norm was associated with higher influential power than the descriptive do-norms.

Study IV proposed that compliance to normative messages can be increased by combining prescriptive and proscriptive injunctive norms, as proscriptions are more likely to attract attention and prescriptions are less likely to result in reactance effects. In a field experiment targeting energy conservation, we first replicated past studies showing that an implicit descriptive norm promoted energy conservation. Second, the results supported the proposition that prompts including both prescriptive and proscriptive content would elicit higher compliance (88.1%) than prompts including either prescriptive or proscriptive content (78.6%). As a possible explanation, a follow-up online survey showed that proscriptions were associated with higher negative emotions, indicating that they may attract more attention. Moreover, prescriptions were rated lower in reactance. We therefore suggest that adding prescriptive content to a proscriptive prompt will increase compliance because of reduced reactance. We also found that 80.5% of participants in our sample expected the prescriptive prompt to be the most influential normative message. Still, the prescriptive prompt was the least effective in promoting energy conservation behavior in Experiment 1. This finding emphasizes the importance of theory-based intervention techniques.

Contest-based and norm-based interventions

In an intervention campaign promoting pro-environmental behavioral change, the designer of the intervention will use one or more techniques to influence people. For the designer, the aim is to promote behavioral change among the individuals involved in the intervention. Therefore, it would be desirable for the designer to develop an intervention that has as large an impact as possible on the targeted behavior. So which intervention technique should the designer use? It is important to notice that interventions can be based on a variety of psychological tools (Schultz, 2014), and that interventions using different tools may frame different goals (Lindenberg, 2001).

(How) do contest-based interventions change behavior? Study I and Study II compared contest-based and norm-based interventions to examine their behavioral and psychological implications. These intervention techniques could both be described in terms of social comparisons (Festinger, 1954). That is, both the contest-based and the norm-based intervention use other people as referents for one's own actions. In terms of a social comparison process, people in the contest-based intervention compare themselves to other people in order to outperform them. In contrast, in a norm-based intervention people compare themselves to other people to adjust their own behavior to others'. More abstractly put, the social comparison process in the contest could be described as a movement away from others,

while the social comparison in the norm-based intervention is a movement toward others. Based on GFT (Lindenberg, 2001), we predicted that contest-based interventions would frame a gain goal. Consequently, a gain goal frame would sensitize people to their own resources, making them think about and act in accordance with motives to make as much money as possible and to win a prize. Participants were therefore expected to use the information about other people to outperform the other contestants. Results from Study I Experiment 1 found that a task related to energy conservation offering the possibility to make money was performed more intensively in the contest condition than in the norm condition, suggesting that participants in the contest condition are motivated to outperform others. Study I Experiment 2 further examined these results, showing that the contest-based intervention technique incited participants to work faster, but also led them to make more errors. In line with GFT, these findings suggest that a contest-based intervention can promote intensive engagement in the targeted behavior. However, these experiments indicate that the engagement was instrumental in nature, that is, based on the goal to make money or win, rather than associated with pro-environmental obligations and intentions for future engagement in pro-environmental behaviors. Adding to past experiments showing that competitive elements can promote energy conservation (e.g., Reeves et al., 2015), the present findings also showed that such engagement is short-lived and possibly instrumental, indicating that normative considerations were pushed into the background of attention. This may explain why Alberts et al. (2016) found that adding a competitive element to a norm-based intervention reduced the long-term effect of energy conservation. Given that goals have different a priori strength, where gain goal is stronger than the normative goal (Lindenberg, 2000), adding a gain goal would push normative considerations into the background of attention. This is generally in line with the crowding out hypothesis (e.g., Frey & Jegen, 2001), and studies showing that financial rewards (Mellström & Johannesson, 2008) or fines (Gneezy & Rustichini, 2000) decrease socially responsible behaviors.

Contests and internal motivation. The theoretical basis of Study I and Study II overlaps with motivational theories such as forced compliance (Festinger & Carlsmith, 1959), over-justification effect (Lepper, Greene, & Nisbett, 1973, and crowding-theory (Frey & Oberholzer-Gee, 1997; Frey & Jegen, 2001) derived from cognitive dissonance theory (Festinger, 1957), self-perception theory (Bem, 1972), and self-determination theory (SDT; Deci, 1971; Deci et al., 1999). All these motivational theories generally suggest that contextual cues will affect how people make internal or external attributions of motivation. Theories based on SDT suggest that peoples' internal motivation will decrease as a function of external motivators. This is generally in line with cognitive dissonance and self-perception, with the exception that these theories do not presume internal motivation in the first place (see, Deci et al., 1999). In line with forced compliance (Festinger & Carlsmith, 1959), the over-justification effect (Lepper et al., 1973), and crowding-theory (Frey & Oberholzer-Gee, 1997), it has been argued that the tendency for external factors to decrease or increase intrinsic motivation depends on whether these factors are perceived as controlling (Deci et al., 1999; Reeve & Deci, 1996). Although there are important differences between SDT and GFT (see Lindenberg, 2001, for a discussion), our findings are in line with the main aspects of SDT. The present studies neither examined nor predicted that the contest-based intervention would be perceived as more controlling than the norm-based intervention. However, acting upon a normative goal could be described as a form of intrinsic motivation (Steg et al., 2016; Lindenberg, 2000; Van der Werff, Steg, & Keizer, 2013), while the gain goal seems to

correspond to performing the behavior under external motivation (Deci et al., 1999). Past research has indeed found that contests undermine intrinsic motivation (Deci, Betley, Kahle, Abrams, & Porac, 1981). It could, however, be argued that norm-based interventions are actually based on extrinsic motivations, because other peoples' behavior or/and (dis)approval could be seen as an external force. Still, to decrease intrinsic motivation, as discussed above, such external forces must be perceived as controlling which may not be the case in normative influence (e.g., Nolan et al., 2008). Because Study I did not include a control group, we do not know whether motivation was crowded in or out. Recent research has found that monetary framing of energy-saving tips did not affect intrinsic motivation any more than the control condition; however, when energy saving was framed as pro-environmental, intrinsic motivation for energy conservation increased (Steinhorst & Klöcker, 2017).

(How) do norm-based interventions change behavior? Drawing on GFT, we predicted that acting upon normative feedback in a norm-based intervention would frame a normative goal. Hence, people would perceive the targeted behavior in normative terms (i.e., thinking about energy conservation in terms of “appropriateness” and what one “ought to do”). Lindenberg and Steg (2013) suggest that observing other people's normative actions is likely to frame a normative goal. This proposition is in line with the work of Cialdini et al. (1991) on activation of social norms, making the anti-litter norm salient through a confederate's behavior which draws attention to the behavioral tracks of others (i.e., a clean versus littered environment). Different types of norms, however, may differ in perceived extrinsic pressure. For example, Study IV found that proscriptive norms were rated as higher in psychological reactance than prescriptive norms. Since reactance is defined as self-defense against a perceived threat to one's freedom it may be that proscriptive norms are motivated more externally than prescriptive norms. The suggestion that norms differ in their motivational basis was also elaborated by Thøgersen (2006), showing that descriptive norms are most strongly externally motivated, while integrated norms are most strongly internally motivated. The ability of norm-based interventions to frame a normative goal resulting in increased perceived obligations may thus depend on which social norms are used, whether norms are perceived as externally or internally motivated, and how the social normative information is provided.

Spillover effects. Past research has shown a great interest in spillover effects within environmental intervention campaigns, examined in empirical studies (Evans et al., 2013; Littleford et al., 2014; Thøgersen, & Noblet, 2012; Thøgersen, & Ölander, 2003), and discussed in reviews (Dolan & Galizzi, 2015; Nilsson et al., 2016; Thøgersen & Crompton, 2009; Truelove et al., 2014). As an implication of proposing that the norm-based intervention frames the normative goal, we predicted that the activated normative goal would also make people perceive non-targeted behaviors (although related to the targeted behavior) as normative. For example, we expected that learning that other people approve of and engage in energy conservation will not only make people perceive energy conservation as the right thing to do, but also perceive other conservation behaviors as normative. When assessing contest-based and norm-based intervention techniques, we predicted and found positive spillover tendencies in the norm-based intervention only.

Did we actually measure spillover effects? Spillovers are defined as behavior A causing behavior B (Nilsson et al., 2016). Yet, Study I measured differences in personal norms between two intervention techniques. First, in Study I we do not know whether it was the behavioral engagement (behavior A) in the norm-based or the contest-based intervention

technique that caused the tendencies for different strength in personal norms. Second, the outcome variable (personal norms) is not a behavior. Therefore, it may be conceptually inadequate to call our findings in Study I a spillover effect. In Study II, we once again predicted that positive spillovers would be found in the norm-based intervention only. One strength of Study II is that we used repeated measures of both behavior A (electricity conservation) and behavior B (recycling and water conservation). This approach allowed us to examine the correlations between change in both behavior A and behavior B⁶. However, the predicted path, that behavior A caused the change in behavior B cannot be established. It should be noted that the positive correlation between electricity conservation and water conservation was only found in the norm condition, which may indicate an important difference between the contest-based and norm-based intervention techniques in terms of spillover effects. However, this finding could be interpreted as a negative spillover, given that the two conservation behaviors are positively correlated at baseline. Such an interpretation would suggest that it was the contest that made participants less likely to also conserve water.

The positive spillover effect may be explained in terms of cognitive dissonance (Festinger, 1957; Thøgersen & Crompton, 2009), self-perception processes (Bem, 1972; Cornelissen, Pandelaere, Warlop, & Dewitte, 2008; van der Werff, Steg, & Keizer, 2014), action-based learning (Thøgersen & Noblet, 2012), or goal-framing (Evans et al., 2013; Fishbach, Dhar, & Zhang, 2006; Steg et al., 2016; Steinhorst et al., 2015). We adopt a goal-based perspective on spillover effects. In goal competition, the underlying assumption is that cognitive resources are limited, and therefore focusing on one goal will limit the cognitive resources accessible for alternative goals. In the theory of dynamic goal-based choice, Fishbach and Dhar (2007) differentiate between two self-regulation processes: highlighting a single goal (promoting commitment) or balancing between multiple goals (promoting liberation between goals). Goal dynamics may thus explain both positive and negative spillover effects. From this point of view, a positive spillover effect could be understood in terms of how goal commitment reinforces multiple actions. Framing pro-environmental behavior in terms of self-transcendence or normative goals, versus self-interest or gain goals, has been shown to result in positive spillovers across behaviors. For example reading about carpooling in pro-environmental terms, plausibly activating a goal to act environmental friendly, has been found to increase recycling behavior more effectively than when carpooling was framed in economic terms (Evans et al., 2013). In line with these findings, environmental (but not monetary) framing of energy usage was found to be associated with climate-friendly intentions (Steinhorst et al., 2015). A negative spillover, on the other hand, could be understood in terms of goal liberation leading to substitutions of actions (Fishbach & Shaddy, 2016) because completion of goals decreased motivation (Touré-Tillery & Fishbach, 2014). An effect shown in for example the “Zeigarnik effect” demonstrating that memory is better for unfulfilled than fulfilled goals. An applied finding is that driving a fuel efficient car has been linked to more driving (Matiske, Menges, & Spiess, 2012), possibly because people perceived the environmental goal as “fulfilled”. The possibility of an intervention building on normative goal-framing to elicit positive spillover effects between pro-environmental behaviors seems both theoretically plausible (Bolderdijk & Steg, 2015; Lindenberg & Steg,

⁶ The statistical analysis could however be criticized for using “change variables” rather than latent variables (McArdle, 2009).

2007, 2013) and in line with past studies showing that personal norms can mediate or moderate positive spillover effects (Steinhorst et al., 2015; Thøgersen, 2004).

Lack of support for behavioral change in the norm-based intervention. The lack of support for electricity conservation in the norm-based intervention in Study II Experiment 2 was surprising given past research (e.g., Allcott, 2011; Hirayama, 2016; Schultz et al., 2007). However, these effects are generally small, resulting in a reduction of about 2% (Allcott, 2011; Hirayama, 2016). Therefore, minor experimental flaws may be sufficient to neutralize the impact of normative information. A possible explanation for the lack of effect is that our social normative feedback was insufficient. For example, the intervention material (i.e., the prompts in the stairwell) was unfortunately removed during the intervention period. A second explanation could be weaker engagement among participants in Experiment 2 than in Experiment 1. Our control questions showed that 95% of the participants in Experiment 1 had seen the prompts while only 77% had in Experiment 2. Overall, our control questions indicated that participants in Experiment 2 were less engaged than participants in Experiment 1. For example, only 57% read the feedback mail and 68% report putting up the refrigerator magnet in Experiment 2, while 95% put up the refrigerator magnets in Experiment 1.

The personal norm: causality and increase versus activation. In Studies I and II, we hypothesized that the positive relationship between personal norms and engagement in the targeted behavior would be stronger in the norm-based intervention. This interaction was not supported⁷. In an additional analysis, a moderated mediational analysis found that personal norms mediated the path between engagement and intention about future energy conservation in the norm condition ($ab_{\text{norm}} = 0.16$, $BCCI_{\text{ab}} [0.05, 0.27]$) but not in the contest condition ($ab_{\text{contest}} = 0.04$, $BCCI [-0.01, 0.09]$). The difference between these two indirect effects was also significant, as suggested by *The Index of Moderated Mediation* (Hayes, 2014), $IMM = 0.12$, $BCCI = [0.01, 0.25]$. These data may suggest that the mediating role of perceived obligations depends on the level of engagement. That is, a critical amount of engagement in the norm-based intervention may be needed for personal norms to be activated. However, these data also cast light on the causal limitations in Study 1. Did *preexisting* personal norms become activated in the norm-based intervention, but not in the contest-based intervention, or did the norm-based intervention *cause* increased personal norms, which in turn caused long-term effects? Since situational cues can frame one of the three overarching goals (steering our cognitive processes aligned with that goal), it could be expected that people will think about energy conservation in terms of “obligations” and “oughtness” under a normative goal frame. But are personal norms sufficiently malleable? That is, is it reasonable to expect personal norms to “increase” for participants in the norm condition, or should we rather expect personal norms to be more salient (without increasing) in the norm-based intervention? Steg et al. (2016) suggest that goal-framing processes can explain why people do not have stable preferences. Still, this does not distinguish between an “increase model” and an “activation model” of personal norms under a normative goal frame (or under a norm-based intervention). One possibility is that personal norms can be activated, but not increased, in people with high preexisting personal norms (due to floor effects). But for an individual lacking such a personal norm, a normative goal frame would foster a personal norm, tentatively via self-perception

⁷ Two separate correlation analyses did however indicate that the correlation was stronger in the norm condition ($r = .35$, $p = .006$) than in the contest condition ($r = .22$, $p = .12$).

and internalization processes. In other words a norm-based intervention in that case may initiate pro-environmental behavior via normative pressure that, once performed, may reinforce development of an internal sense of oughtness (see e.g., Venhoeven, Bolderdijk, & Steg, 2016).

Alignment of goals. Steg et al. (2016) suggest that pro-environmental behaviors can be encouraged by removing or reducing the conflict between the overarching goals (see also Maio, Pakizeh, Cheung, & Rees, 2009). However, the difference in a priori strength of the gain and normative goals may inhibit increased effects on behavioral change when interventions use both types of goal. For example, Alberts et al. (2016) found that long-term effects on energy saving was inhibited by adding a contest to a norm-based intervention. Similarly, it has been found that payment decreases behavioral engagement, and that this decrease could be inhibited by providing participants with social rewards rather than monetary rewards (Heyman & Ariely, 2004). It should, however, be noted that Heyman and Ariely (2004) also showed that decreased behavioral engagement decreased once again when the social rewards were presented in combination with their equivalent monetary value. In line with this demonstration of social rewards, Deci et al. (1999) found that verbal rewards increased rather than decreased internal motivation. From a goal-framing perspective, these findings may suggest that gain goals and normative goals could be aligned when rewards are verbal or social rather than monetary. These findings could be interpreted as a gain goal pushing away the normative goal when both types of goal are used. The possibility of goal alignment may have implications for both contest-based and norm-based intervention techniques; it is a question for future research to examine whether the contest-based intervention technique could be designed to promote behavioral change without pushing away the normative goal.

Means and goals in goal-framing. Goal systems theory (Shah et al., 2003) introduces a system of means and goals (or ends). Goal systems could be structured in multifinality, using one means to reach multiple goals, or equifinality, where multiple means are directed toward one goal. Equifinality, however, implies *means dissociations*, where multiple means to a goal weaken the association between each individual mean and the goal. Multifinality, on the other hand, implies *goal dissociation*, where a strong relationship between means to a specific goal will weaken the relationship between these means and other goals (Shah et al., 2003). As such, the crowding out effect could be described as a situation where one means (internal motivation) has a strong relation to one specific goal (behavioral engagement), but when a second goal (tangible reward) is introduced, the prior relation (internal motivation—behavioral engagement) will be weakened. Similarly, given a positive relationship between the means of energy conservation and the goal of acting pro-environmentally, introducing a financial incentive will weaken that relationship. In GFT the distinction between means and goals is lacking. Instead, GFT seems to predict that framing a goal will affect both means and goals. But that may not always be the case. For example, imagine that you are on the way to a family dinner by car when you suddenly realize that time is running out. You will not make it in time. Being late for the family dinner would indeed be disapproved, hence a norm violation. Normative considerations have now been framed and are activated. But in order to act appropriately, in this case to be in time for the family dinner, you increase the speed of your car above the speed limit and thus violate traffic rules. This example suggests a paradox: under a norm goal frame, with the activated goal to act appropriately, the means to reach that

goal are not necessarily normative in terms of compliant collective actions. It may therefore be fruitful for future research to make a distinction between means and goals (or ends) in GFT (see Touré-Tillery & Fishbach, 2014, for a review).

Implications of the intervention techniques. When should a contest-based or a norm-based intervention technique be used? Study I and Study II suggests that contest-based interventions could be used to promote rapid behavioral change, and norm-based interventions for more general, perhaps more long-lasting, behavioral change. Schultz (2014) suggested that both contests and norms should be used when the targeted behavior is associated with low benefits, that contests should be used when barriers are high, and that social norms should be used when barriers are low. This suggestion seems compatible with our results, since the rapid and intensive behavioral patterns in the contest-based intervention technique could possibly overcome higher barriers to pro-environmental actions. Finally, the level of energy conserved in contest-based and norm-based intervention techniques may also depend on the targeted behaviors. For example, if the intervention targets efficiencies (one-time behaviors that are costly but have long-term effects), a contest-based intervention technique may be suitable, since these energy conservation behaviors are “self-driven” after implementation. In this case, the contest may provide an appropriate motivation for an intensive but short-lived energy conservation behavior. However, if the intervention targets curtailments (repetitive behaviors characterized by low cost and low effort), a norm-based intervention technique may be more suitable, since the less intensive but longer-term behavioral change is in line with the usual behavioral response to normative information.

Strengthening normative influence

Research on normative influence has compared the influence of social norms both to other social influence techniques (e.g., Schultz et al., 2016) and to different types of normative influence messages (e.g., De Groot, Abrahamse, & Jones, 2013). It has, for example, been found that the impact of social norms can be increased by aligning injunctive and descriptive norms (e.g., Schultz et al., 2007) or by increasing the size (e.g., Kormos et al., 2014) or the physical proximity (Goldstein et al., 2008) of the reference group. Both Study III and Study IV focused on conceptual refinements and compared different types of social norms aiming to improve their impact. Both studies also used the concept of attention, building on well-documented research suggesting that people have a general tendency (Baumeister et al., 2001; Rozin & Royzman, 2001) to attend to (Hansen & Hansen, 1988) and weigh (Kahneman & Tversky, 1979) negative stimuli more than positive stimuli. Therefore, it was predicted that social norms signaling what others avoid and using negatively valenced information (combined with positive), would be more influential than messages signaling others’ approach behavior or using exclusively positively valenced information.

Do- and don’t norms. The descriptive norm, signaling the prevalence of a behavior, has traditionally been operationalized as what other people are doing (i.e., do-norm). In Study III we suggested that the descriptive norm could also signal what other people are *not* doing (i.e., don’t-norm). It was predicted that conformity to don’t-norms will be greater than conformity to do-norms, as people are generally more influenced by negative than positive stimuli (Baumeister et al., 2001). Three experiments indicated that more participants conformed to other peoples’ choices when these choices were framed as don’t-norms than do-norms. This higher conformity to the don’t-norm was explained as a consequence of peoples’ tendency to

interpret avoidance signals as more alarming than approach signals (see Baumeister et al., 2001; Rozin & Royman, 2001). More specifically, studies have found that people are more concerned about avoiding negative feedback than maximizing positive feedback (Tice, 1991) and that people weigh negative social support more heavily than positive social support (Manne, Taylor, Dougherty, & Kemeny, 1997). People have also shown to spent longer time looking at negative behaviors or traits than at positive behaviors or traits, suggesting that people pay more attention to the negative than the positive (Fiske, 1980; Pratto & Bargh, 1991).

One explanation for our results then is that don't-norms attract more attention than do-norms. This explanation is supported by past research reporting that participants showed better memory for negative information than positive information (Pratto & Bargh, 1991). One way to test whether attention caused the effect is through memory. If increased attention explains the effect, we would expect that more participants in the don't-norm condition attended to the norm and thus that more participants would remember the norm than in the do-norm condition. Data from Study III actually shows the opposite pattern: when assessing the attention checks participants in the do-norm condition were 10% more likely to report the correct norm than participants in the don't-norm condition. A second explanation is that the consequences of not conforming to the norms are unequally weighted. Not conforming to the do-norm may be interpreted as possibly missing an opportunity, while not conforming to the don't-norm may be interpreted as possibly exposing oneself to a risk. Thus, the higher conformity to the don't-norm than to the do-norm may be a special case of risk aversion (Kahneman & Tversky, 1979).

Prescriptive and proscriptive norms. Although past research has shown that salience moderates the effect of social norms, techniques to increase the salience of social norms seem scarce (Cialdini et al., 1991). Study IV built on FTNC (Cialdini et al., 1990), and proposed an attention-reactance proposition as a theoretical contribution to the FTNC and as an intervention technique to promote compliance to normative information. Study IV predicted that an attention-reactance function would increase compliance to normative information. Hence, in an extension of the FTNC, Study IV Experiment 1 combined the prescriptive and proscriptive injunctive norms to increase compliance. In line with the hypotheses, a field experiment using normative prompts found that a dual-injunctive prompt (combining both prescriptive and proscriptive content) elicited higher compliance than a single-injunctive prompt (including exclusively prescriptive or proscriptive content). Although the role of emotional activation has been examined in the context of FTNC (Cialdini et al., 2006; Reno et al., 1993), FTNC does not propose strategies to make norms salient. Hence, Study IV draws on FTNC to derive and test a possible method for increasing compliance to social norms by combining the prescriptive and proscriptive norms.

Fear-inducing communication. Study IV used proscriptive prompts to attract attention, similar to fear-inducing communication in health campaigns, as both techniques seek to change behavior in reaction to unappealing or negative information. What can we learn from fear-inducing communication? Fear arousal is a response to threatening stimuli that trigger unpleasant emotions, such as health warnings on cigarette packages. These messages are based on the assumption that vivid negative information will promote behavioral change. However, although fear arousal seems to promote attention, the reaction to these messages may be defensive, for example avoiding the negative information rather than avoiding the

targeted behavior (Ruiter, Kesseles, Peters, & Kok, 2014). Likewise, a meta-analysis assessing HIV-prevention interventions found that interventions attempted to induce fear of HIV were less effective than interventions based on attitudinal arguments, educational information, behavioral skills arguments, and behavioral skills training (Albarraín, Gillette, Earl, Glasman, Durantini, & Ho, 2005). Taken together, it seems like using exclusively fear-inducing communication may have drawbacks in terms of behavioral change. This is in line with the results of Study IV, showing that exclusively proscriptive information promoted less behavioral change than when it was combined with prescriptive information.

Practical considerations

This thesis provides some practical suggestions for designing interventions aimed to promote pro-environmental behavior. As discussed earlier, the first two studies may provide some practical implications of contest-based versus norm-based interventions. A first practical implication is that we found the response to the contest-based intervention to be intensive yet short-lived. Hence, the contest-based intervention may be applied when the intervention aims to encourage pro-environmental behaviors rapidly. Importantly, some pro-environmental behaviors (such as energy conservation efficiencies) are not dependent on long-term engagement, but are self-driven once performed. The contest may be suitable for changing behaviors such as buying more energy efficient household products or installing solar panels. However, the reduced environmental impact of these behaviors may be limited due to negative spillover effects, such as the rebound effect, defined as increased effectiveness leading to increased demand. In our example above, the rebound effect would predict that people will increase their electricity usage after putting up solar panels. Another potential drawback also described by negative spillover (or moral licensing) is that engaging in one pro-environmental behavior, such as installing solar panels, may make people less willing to engage in additional pro-environmental actions. Therefore, motivation for long-term engagement and implications for non-targeted pro-environmental behaviors are important practical implications. Based on our findings, the norm-based intervention may be best applied when interventions seek to provide long-term and non-targeted pro-environmental engagement. It should however be noted that we found these effects to be small and uncertain. Study III and Study IV provide a second branch of practical implications suggesting that norm-based interventions can be improved by using normative information that attracts attention and reduces reactance, and by using normative information that signals other people's avoidance rather than other people's engagement. Therefore, when providing normative information, in smart phone applications, for example, practitioners may want to consider first, whether the information attracts attention without being obtrusive, and second, whether the information can be framed as what other people avoid rather than what other people engage with.

Ethical considerations

In Study IV Experiment 1, participants were unobtrusively observed without their explicit consent and debriefing. However, the observed behavior was short, specific, unrecorded, and conducted in a public area, which decreases the need for signed consent (Sussman, 2016). Moreover, although the observed energy conservation behavior can have societal implications at the aggregate level, it seems reasonable to believe that turning off the lights or not after leaving a public bathroom is generally perceived as a trivial act for the individual. In line with past research (e.g., Keizer et al., 2008), the present field experiment involved behavioral

observations that were both anonymously coded and reported at the aggregate level. Therefore, we argue that Study IV Experiment 1 was not a violation of personal integrity and did not in any way harm participants.

Limitations

Limitations of Study I. A first limitation is that Study 1 did not use a control group. In Study 1, our aim was to compare two interventions governed by different goal-framing processes. We found it both practically and theoretically implausible to compare the gain framing (contest) and normative framing (norm) groups to a control group that represented a “neutral goal frame”. Therefore, we chose to not include a control group in Study I. Second, 36 participants were excluded in Study I. This attrition may have affected the results, but was closely tied to our attention-checks and outliers in the data. Because Study I used MTurk, a service that is relatively new in psychological research, we placed extra weight on data quality and took extra care in reporting this practice with full transparency as presented in all experiments. Third, during the review process, we dropped one Experiment. In order to be transparent and to provide justifications for why the personal norm was used as a dependent variable in Study I, we attach our first Experiment in Study I as Appendix A.

Limitations of Study II. First, Experiment 1 did not include a control condition. Differences in electricity usage behaviors could thus only be compared between our two conditions. However, Experiment 2 complemented Experiment 1 in including a control condition. Second, Experiment 1 suffered from low power due to the small sample. However, Experiment 2 aimed to, and did, recruit more participants than Experiment 1. Third, In Experiment 2 approximately half of the posters were taken down during the intervention, plausibly weakening the manipulation. Finally, both Experiment 1 and Experiment 2 used a student household sample, limiting the external validity of the results.

Limitations of Study III. First, In Study III neither Experiment 1 nor Experiment 2 found significant differences of choice between the do- and don't-norm. However, Experiment 3 did show that the norm conditions differed significantly; it should also be noted that all three experiments consistently found that don't-norms promoted higher conformity than do-norms. Second, the processes driving our proposed difference between the do-norm and don't-norm are not clearly established. We do however discuss plausible mechanisms that may drive the effect. Moreover, it should be noted that the distinction between do- and don't-norms are a new conceptual proposition, therefore Study III should be seen as the first series of experiments aiming to test whether there is a difference between do- and don't-norms. We encourage future research to replicate our findings and examine the psychological mechanism that may drive the effect.

Limitations of Study IV. First, there may be drawbacks to using negatively valenced stimuli, which may inhibit long-term effects due to the mobilization–minimization function derived from an organism's tendency to respond to negative events with short-term mobilization and long-term minimization (Taylor, 1991). Second, we have argued that proscriptive prompts were easier to detect than prescriptive prompts, and therefore increased conformity. However, an alternative explanation is that proscriptive prompts (or rather the combination of proscriptive and prescriptive prompts) lead to more extensive elaboration, which is the basis for increased conformity. Third, compliance to prescriptions versus proscriptions may depend

on the situation. Study IV was conducted in a campus library where people may accept proscriptions more than they would at home. This may explain why the results did not support our predicted reactance effect, but it also raises questions about the generalizability of using proscriptive norms. Fourth, Study IV Experiment 1 used self-rated emotions as a measure of attention. This operationalization is limited. Still, there is a well-documented theoretical basis for a relation between emotional reaction and attention (Baumeister et al., 2001; Hansen & Hansen, 1988), which may justify our choice of measurement. Fifth, reactance was operationalized by using three items based on the QMPR, which suffers from low reliability. However, these low Cronbach's alpha scores are not surprising, since we measured three separate factors of reactance with three single items aimed to produce complementary measures of the reactance construct. As an additional analysis, we conducted three variance analyses, one for each reactance item. The results were generally in line with the pattern reported in Study IV Experiment 2 (see appendix B).

Conclusion

This thesis applies social norms to the investigation of intervention techniques targeting human behavior and motivations for residential energy conservation. Adding to the body of research on social norm techniques to promote pro-environmental behaviors, it examines psychological and behavioral differences between contest-based and norm-based intervention techniques. The thesis also proposes and provides support for a conceptual distinction between descriptive “do-norms” and “don’t-norms”. Three experiments generally supported our predictions that people are more inclined to adjust their behaviors to others’ avoidance tendencies (don’t-norm) than to others’ approach tendencies (do-norm). Finally, an attention–reactance relation was proposed and supported, showing that normative prompts that included both prescriptive and proscriptive injunctive norms resulted in more participants saving energy than prompts including exclusively prescriptions or proscriptions.

REFERENCES

- Aarts, H., & Dijksterhuis, A. (2003). Silence in the library: Environmental, situational norms, and social behavior. *Journal of Personality and Social Psychology, 84*(1), 18 – 28.
- Aarts, H., Dijksterhuis, A., & Custer, R. (2003). Automatic normative behavior in environments: The moderating role of conformity in activating situational norms. *Social Cognition, 21*(6), 447-464.
- Abrahamse, W., & Steg, L. (2013). Social influence approaches to encourage resource conservation: A meta-analysis. *Global Environmental Change, 23*, 1773-1785.
- Abrahamse, W., Steg, L., Vlek, C., Rothengatter, T. (2005). A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology, 25*, 273-291.
- Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2007). The effect of tailored information, goal-setting, and tailored feedback on household energy use, energy-related behaviors, and behavioral antecedents. *Journal of Environmental Psychology, 27*(4), 265-276.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.

- Ajzen, I. (2012). The theory of planned behavior. In P. A. M. Lange, A. W. Kruglanski., & E.T. Higgins. (Eds.), *Handbook of Theories of Social Psychology* (Vol. 1, pp. 438-459). London. UK: Sage.
- Albarraín, D., Gellette, J. C., Earl, A., Glasman, L. R., Durantini, M. R., & Ho, M. H. (2005). A test of majority assumptions about behavior change: A comprehensive look at the effects of passive and active HIV-prevention interventions since the beginning of the epidemic. *Psychological Bulletin*, *131*, 856-897.
- Alberts, G., Gurguc, Z., Koutroumpis, P., Martin, R., Muuls, M., & Napp, T. (2016). Competition and norms: A self-defeating combination? *Energy Policy*, *96*, 504-523.
- Allcott, H. (2011). Social norms and energy conservation. *Journal of Public Economics*, *95*, 1082-1095.
- Allcott, H., & Mullainathan, S. (2010). Behavior and energy policy. *Science*, *327*, 1204-1205.
- Andersson, M., Eriksson, O., & von Borgstede., C. (2012). The effects of environmental management systems on source separation in the work and home settings. *Sustainability*, *4*, 1292-1308.
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology*, *40*, 471-499.
- Asch, S. E. (1956). Studies of independence and conformity: A minority of one against an unanimous majority. *Psychological Monographs*, (70)9.
- Atkins, C. K. (2001). Theory and principles of media health campaigns. In R. E. Rice., & C. K. Atkin. (Eds.), *Public Communication Campaigns* (3ed), New Park, CA: Sage.
- Bagozzi, R. P., & Dholakia, U. (1999). Goal setting and goal striving in consumer behavior. *The Journal of Marketing*, *63*, 19-32.
- Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, *27*(1), 14-25.
- Bargh, J. A. (1994). The four horsemen of automaticity: Intention, awareness, efficiency, and control as separate issues. In R. Wyer and T. Srull. (Eds.), *Handbook of Social Cognition* (pp. 1-40). Lawrence Erlbaum.
- Bargh, J. A. (2006). What have we been priming all these years? On the development, mechanisms, and ecology of non-conscious social behavior. *European Journal of Social Psychology*, *36*(2), 147-168.
- Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype activation on actions. *Journal of Personality and Social Psychology*, *71*(2), 230-244.
- Bargh, J. A., Gollwitzer, P. M., Lee-Chai, A., Barndollar, K., & Trötschel, R. (2001). The automated will: Nonconscious activation and pursuit of behavioral goals. *Journal of Personality and Social Psychology*, *81*(6), 1014-1027.
- Bargh, J. A., & Morsella, E. (2008). The unconscious mind. *Perspectives on Psychological Science*, *3*(1), 73-79.
- Bateson, M., Nettle, D., & Roberts, G. (2006). Cues of being watched enhance cooperation in a real-world setting. *Biology Letters*, *2*(3), 412-414.
- Bator, R. J., Tabanico, J. J., Walton, M. L., & Schultz, P. W. (2014). Promoting energy conservation with implied norms and explicit messages. *Social Influence*, *9*(1), 69-82.
- Baumeister, R. F., Bratslavsky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad is stronger than good. *Review of General Psychology*, *5*(4), 323-370.

- Bem, D. J. (1972). Self-perception theory. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology*, 6, 1-62. New York: Academic.
- Berger, P. L., & Luckmann, T. (1966). *The Social Construction of Reality*. Penguin: UK.
- Bergquist, M., & Nilsson, A. (2017^b). Using social norms in smart meters: the norm distance effect. Manuscript submitted for publication
- Blanken, I., van de Ven, N., & Zeelenberg, M. (2015). A meta-analytic review of moral licensing. *Personality and Social Psychology Bulletin*, 41(4), 540-558.
- Bolderdijk, J. W., Steg, L., Geller, E. S., Lehman, P. K., & Postmes, T. (2012). Comparing the effectiveness of monetary versus moral motives in environmental campaigning. *Nature Climate Change*, 3, 413-416
- Bolderdijk, J. W., & Steg, L. (2015). Promoting Sustainable Consumption: The Risk of Using Financial Incentives. In L. A. Reisch, & J. Thøgersen. (Eds.), *Handbook of Research on Sustainable Consumption* (pp. 328-342). Cheltenham: Edward Elgar.
- Bornstein, G. (1992). The free-rider problem in intergroup conflicts over step-level and continuous public goods. *Journal of Personality and Social Psychology*, 62(4), 597-606.
- Bornstein, G., Gneezy, U., & Nagel, R. (2002). The effect of intergroup competition on group coordination: An experimental study. *Games and Economic Behavior*, 41(1), 1-25.
- Brehm, J. W. (1966). *A Theory of Psychological Reactance*. New York: Academic Press.
- Brunder, J. S., & Goodman, C. C. (1947). Value and need as organizing factors in perception. *The Journal of Abnormal and Social Psychology*, 42(1), 33-44.
- Buchanan, K., Russo, R., & Anderson, B. (2015). The question of energy reduction: The problem(s) with feedback. *Energy Policy*, 77, 89-96.
- Burger, J. B., & Shelton, M. (2011). Changing everyday health behaviors through descriptive norm manipulations. *Social Influence*, 6(2), 67-77.
- Cacioppo, J. T., & Gardner, W. L. (1999). Emotion. *Annual Review of Psychology*, 50, 191-214.
- Cacioppo, J. T., & Berntson, G. G. (1999). The affect system: Architecture and operation characteristics. *Current Directions in Psychological Science*, 8(5), 133-137.
- Cacioppo, J. T., Petty, R. E., Feng Kao, C., & Rodriguez, R. (1986). Central and peripheral routes to persuasion: An individual difference perspective. *Journal of Personality and Social Psychology*, 51(5), 1032-1043.
- Catlin, J. R., & Wang, Y. (2012). Recycling gone bad: When the option to recycle increases resource consumption. *Journal of Consumer Psychology*, 23, 122-127.
- De Groot, J. I. M., Abrahamse, W., & Jones, K. (2013). Persuasive normative messages: The influence of injunctive and personal norms on using free plastic bags. *Sustainability*, 5, 1829-1844.
- De Kort, Y. A. W., McCalley, L. T., & Midden, C. J. H. (2008). Persuasive trash cans: Activation of littering norms by design. *Environment and Behavior*, 40, 870 - 891.
- Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology*, 18(1), 105-115.
- Deci, E. L., Betley, G., Kahle, J., Abrams, L., & Porac, J. (1981). When trying to win: Competition and intrinsic motivation. *Personality and Social Psychology Bulletin*, 7(1), 79-83.
- Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, 125(6), 627-668.

- Deutsch, M., & Gerard, H. B. (1955). A study of normative and informational social influence upon individual judgment. *Journal of Abnormal and Social Psychology, 51*(3), 629-636.
- Chitnis, M., Sorrell, S., Druckman, A., Firth, S. K., & Jackson, T. (2013). Turning lights into flights: Estimating direct and indirect rebound effects for UK households. *Energy Policy, 55*, 234-250.
- Cialdini, R. B. (2003) Crafting normative messages to protect the environment. *Current Directions in Psychological Science, 105*-109.
- Cialdini, R. B. (2005). Basic social influence is under estimated. *Psychological Inquiry, 16*, 158-161.
- Cialdini, R. B., Demaine, L. J., Sagarin, B. J., Barrett, D. W., Rhoads, K., & Winter, P. L. (2006). Managing social norms for persuasive impact. *Social Influence, 1*(1), 3-15.
- Cialdini, R. B., & Goldstein, N. J. (2004). Social influence: Compliance and conformity. *Annual Review of Psychology, 55*, 591-621.
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology, 58*, 1015-1026.
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1991). A focus theory of normative conduct: A theoretical refinement and reevaluation of the role of norms in human behavior. *Advances in Experimental Social Psychology, 24*, 201-234.
- Cialdini, R. B., & Trost, M. R. (1998). Social influence: Social norms, conformity, and compliance. In D. T. Gilbert, S. T. Fiske., & G. Lindzey. (Eds.), *The Handbook of Social Psychology* (4th ed., Vol. 2, pp. 151 – 192). Boston: McGraw-Hill.
- Cornelissen, G., Pandelaere, M., Warlop, L., & Dewitte, S. (2008). Positive cueing: Promoting sustainable consumer behavior by cueing common environmental behaviors as environmental. *International Journal of Research in Marketing, 25*(1), 46-55.
- Custer, R., & Aarts, H. (2005). Positive affect as implicit motivator: On the nonconscious operation of behavior goals. *Journal of Personality and Social Psychology, 89*(2), 129-142.
- Dietz, T., Gardner, G. T., Gilligan, J., Stern, P. C., & Vandenbergh, M. P. (2009). Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. *Proceedings of the National Academy of Science of the United States of America, 106*, 18425-18456.
- Dijksterhuis, A., & Bargh, J. A. (2001). The perception-behavior expressway: Automatic effects of social perception on social behavior. *Advances in Experimental Social Psychology, 33*, 1-40.
- Dolan, P., & Galizzi, M. M. (2015). Like ripples on a pond: Behavioral spillovers and their implications for research and policy. *Journal of Economic Psychology, 47*, 1-16.
- Donnell, A. J., Thomas, A., & Buboltz, W. C. (2001). Psychological reactance: Factor structure and internal consistency of the questionnaire for the measurement of psychological reactance. *Journal of Social Psychology, 141*(5), 679-687.
- Durdan, C. A., Reeder, G. D., & Hecht, P. R. (1985). Litter in a university cafeteria. *Environment and Behavior, 17*(3), 387-404.
- Dwyer, P. C., Maki, A., & Rothman, A. J. (2015). Promoting energy conservation behavior in public settings: The influence of social norms and personal responsibility. *Journal of Environmental Psychology, 41*, 30-34.

- Eisenberger, N. I., Lieberman, M. D., & Williams, K. D. (2003). Does rejection hurt? An fMRI study of social exclusion. *Science*, *302*, 290-292.
- Elliot, A. J. (1999). Approach and avoidance motivation and achievement goals. *Educational Psychologist*, *34*(3), 169-189.
- Evans, L., Maio, G. R., Corner, A., Hodgetts, C. J., Ahmed, S., & Hahn, U. (2013). Self-interest and pro-environmental behavior. *Nature climate change*, *3*, 122-12.
- Ferguson, M. A., & Branscombe, N. R. (2010). Collective guilt mediates the effect of beliefs about global warming on willingness to engage in mitigation behavior. *Journal of Environmental Psychology*, *30*(2), 135-142.
- Festinger, L. (1953). An Analysis of Compliant Behavior. In M. Sherif., & M. O. Wilson. (Eds.), *Group Relations at the Crossroads* (pp. 232-256). Oxford, England: Harper.
- Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, *7*, 117-140.
- Festinger, L. (1957). *A theory of cognitive dissonance*. Evanston, IL: Row, Person.
- Festinger, L., & Carlsmith, J. M. (1959). Cognitive consequences of forced compliance. *The Journal of Abnormal and Social Psychology*, *58*(2), 203-210.
- Fischer, C. (2008). Feedback on household electricity consumption: A tool for saving energy? *Energy Efficiency*, *1*, 79-104.
- Fishbach, A., & Dhar, R. (2007). Dynamics of goal-based choice: Towards and understanding on how goals commit versus liberate choice. In C. P. Haugtvedt, P. M. Herr, & F. R. Kardes. Eds. *Handbook of Consumer Psychology* (pp. 611-637). Hillsdale, NJ: Erlbaum Press.
- Fishbach, A., & Ferguson, M. J. (2007). The goal construct in social psychology. In A. W. Kruglanski & E. T. Higgins (Eds.), *Social psychology: Handbook of basic principles* (Vol. 2). New York: Guilford Press.
- Fishbach, A., Dhar., R., & Zhang., Y. (2006). Subgoals and substitutes or complements: The role of goal accessibility. *Journal of Personality and Social Psychology*, *91*(2), 232-242.
- Fischbacher, U., Gaechter, S., & Fehr, E. (2001). Are people conditionally cooperative? Evidence from a public goods experiment. *Economics Letters*, *71*(3), 397-404.
- Fiske, S. T. (1980). Attention and weight in person perception: The impact of negative and extreme behavior. *Journal of Experimental Research in Personality*, *22*, 889-906.
- Fornara, F., Pattitoni, P., Mura, M., & Strazzera, E. (2016). Predicting intention to improve household energy efficiency: The role of value-belief-norm theory, normative and informational influence, and specific attitude. *Journal of Environmental Psychology*, *45*, 1-10.
- Fox, E., Lester, V., Russo, R., Bowles, R. J., Pichler, A., & Dutton, K. (2000). Facial expressions of emotion: Are angry faces detected more efficiently? *Cognition and Emotion*, *14*(1), 61-92.
- Frey, B. S., & Jegen, R. (2001). Motivational crowding theory. *Journal of Economic Surveys*, *15*(5), 589-611.
- Frey, B. S., & Oberholtzer-Gee, F. (1997), The cost of price incentives: an empirical analysis of motivational crowding-out. *The American Economic review*, *87*(4), 746-755.
- Gardner, G. T., & Stern, P. (2002). *Environmental Problems and Human Behavior*. Needham Heights, MA, US: Allyn & Bacon.
- Geller, E. S., Winett, R. A., & Everett, P. B. (1982). *Preserving the Environment: New Strategies for Behavioral Change*, New York: Pergamon Press.

- Chartrand, T. L., & Bargh, J. A. (1999). The chameleon effect: The perception-behavior link and social interaction. *Journal of Personality and Social Psychology*, 76(6), 893-910.
- Gifford, R. (2011). Dragons of inaction: Psychological barriers that limit climate change mitigation. *American Psychologist*, 66(4), 290-302.
- Gifford, R. (2014). Environmental psychology matters. *Annual Review of Psychology*, 65, 541-579.
- Gifford, R., & Nilsson, A. (2014). Personal and social factors that influence pro-environmental concern and behavior: A review. *International Journal of Psychology*, 1-17.
- Gneezy, U., & Rustichini, A. (2000). Pay enough or don't pay at all. *The Quarterly of Economics*, 115(3), 791-810.
- Goldstein, N. J., Cialdini, R. B., & Griskevicius, V. (2008). A room with a viewpoint: Using social norms to motivate environmental conservation in hotels. *Journal of Consumer Research*, 35, 472-482.
- Göckeritz, S., Schultz, P. W., Rendón, T., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2010). Descriptive normative beliefs and conservation behavior: The moderating role of personal involvement and injunctive normative beliefs. *European Journal of Social Psychology*, 40 (3), 514-523.
- Hamann, K. R. S., Reese, G., Seewald, D., & Loeschinger, D. C. (2015). Affixing the theory of normative conduct (to your mailbox): injunctive and descriptive norms as predictors of anti-ads sticker use. *Journal of Environmental Psychology*, 44, 1-9.
- Hansen C. H., & Hansen, R. D. (1988). Finding the face in the crowd: An angry superiority effect. *Journal of Personality and Social Psychology*, 54(6), 917-924.
- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: The Guilford Press.
- Hechter, M., & Opp, K. D. (2001). *Social Norms*. New York: Russell Sage Foundation.
- Heyman, J., & Ariely, D. (2004). Effort for payment a tale of two markets. *Psychological Science*, 15(11), 787-793.
- Hirayama, S. (2016, September). Japan's first large-scale home energy report pilot study: Impact on Japanese consumers' awareness, motivations, and electricity consumption. In *Behave: 4th European Conference on Behaviour and Energy Efficiency*, University of Coimbra, Portugal.
- Hirshleifer, D., & Teoh, S. H. (2003). Herd behavior and cascading in capital markets: A review and synthesis. *European Financial Management*, 9, 25-66.
- Iacobini, M. (2009). Imitation, empathy, and mirror neurons. *Annual Review of Psychology*, 60, 653-670.
- Jacobson, R. P., Mortensen, C. R., & Cialdini, R. B. (2011). Bodies obliged and unbound: Differentiated response tendencies for injunctive and descriptive social norms. *Journal of Personality and Social Psychology*, 100(3), 433-448.
- Jacobson, R. P., Mortensen, C. R., Jacobson, K. J. L., & Cialdini, R. B. (2015). Self-control moderates the effectiveness of influence attempts highlighting injunctive norms. *Social Psychology and Personality Science*, 6(6), 718-726.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47, 263-291.
- Karlin, B., David, N., Sanguinetti, A., Gamble, G., Kirkby, D., & Stokols, D. (2014). Dimensions of conservation: Exploring differences among energy behaviors. *Environment and Behavior*, 46(4), 423-452.

- Karlin, B., Zinger, J. F., & Ford, R. (2015). The effects of feedback on energy conservation: A meta-analysis. *Psychological Bulletin*, *141*(6), 1205-1227.
- Kay, A. C., Wheeler, S. C., Bargh, J. A., & Ross, L. (2004). Material priming: The influence of mundane physical objects on situational construal and competitive behavioral choice. *Organizational Behavior and Human Decision Processes*, *95*(1), 83-96.
- Keizer, K., Lindenberg, S., & Steg, L. (2008). The spreading of disorder. *Science*, *322*(12), 1681-1684.
- Keizer, K., Lindenberg, S., & Steg, L. (2013). The importance of demonstratively restoring order. *Plos One*, *(8)*, 6, 1-7.
- Kelman, H. C. (1958). Compliance, identification, and internalization: Three processes of attitude change. *The Journal of Conflict Resolution*, *2*(1), 51-60.
- Kiley Hamlin, J., Wynn, K., & Bloom, P. (2010). Three-month-olds show a negativity bias in their social evaluations. *Developmental Psychology*, *13*(6), 923-929.
- Kok, G., Schaalma, H., Ruiter, R.A.C., Brug, J. & Van Empelen, P. (2004) Intervention Mapping: Protocol for Applying Health Psychology Theory to Prevention Programmes. *Journal of Health Psychology*, *9*, 85-98.
- Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, *8*(3), 239-260.
- Kormos, C., Gifford, R., & Brown, E. (2014). The influence of descriptive social norm information on sustainable transportation behavior: A field experiment. *Environment and Behavior*, 1-23.
- Kruglanski, A. W. (1996). Goals as knowledge structures. In P. M. Gollwitzer., & J. A. Bargh (Eds.), *The psychology of action*. (pp. 599-618). New York: Guilford Press.
- Lamy, L., Guéguen, N., Fischer-Lokou, J., & Guegan, J. (2016). “Wrong place to get help”: A field experiment on luxury stores and helping behavior. *Social Influence*, *11*(2), 130-139.
- Latené, B. (1981). The psychology of social impact. *American Psychologist*, *36*(4), 343-356.
- Lee, Y., De Young, R., & Marans, R. W. (1995). Factors influencing individual recycling behavior in office settings: A study of office workers in Taiwan. *Environment and Behavior*, *27*(2), 380-403.
- Lepper, M. R., Greene, D., & Nisbett, R. E. (1973). Undermining children’s intrinsic interest with external reward: A test of the “overjustification” hypothesis. *Journal of Personality and Social Psychology*, *28*(1), 129-137.
- Lewicka, M., Czapinski, J., & Peeters, G. (1992). Positive-negative asymmetry or ‘When the heart needs a reason’. *European Journal of Social Psychology*, *22*(5), 425-434.
- Lieberman, V., Samuels, S. M., & Ross, L. (2004). The name of the game: Predictive power of reputations versus situational labels in determining prisoner’s dilemma game moves. *Journal of Personality and Social Psychology Bulletin*, *30*(9), 1175-1185.
- Lindenberg, S. (2000). The extension of rationality: Framing versus cognitive rationality. In J. Baechler, F. Chazel, and R. Kamrane. Eds, *L’Acteur et ses Raisons. Mélanges en l’honneur de Raymond Boudon* (pp. 168-204). Paris: Presses Universitaires de France (PUF).
- Lindenberg, S. (2001). Intrinsic motivation in a new light. *Kyklos*, *54*, 317-342.
- Lindenberg, S., & Steg, L. (2007). Normative, gain and hedonic goal frames guiding environmental behavior. *Journal of Social Issues*, *63*(1), 117-137.

- Lindenberg, S., & Steg, L. (2013). Goal-framing theory and norm-guided environmental behavior. In H. van Trijp. Editor, *Encouraging Sustainable Behavior* (pp. 37-54). New York: Psychology Press.
- Litt, D. M., Lewis, M. A., Stahlbrandt, H., Firth, P., & Neighbors, C. (2012). Social comparison as a moderator of the association between perceived norms and alcohol use and negative consequences among college students. *Journal of Studies on Alcohol and Drugs*, 73(6), 961-967.
- Littleford, C., Ryley, T. J., & Firth, S. K. (2014). Context, control and the spillover of energy use behavior between office and home settings. *Journal of Environmental Psychology*, 40, 157-166.
- Lundqvist, D., Juth, P., & Öhman, A. (2014). Using facial emotional stimuli in visual search experiments: The arousal factor explains contradictory results. *Cognition and Emotion*, 28(6), 1012-1029.
- Mallett, R. K., Melchiori, K. J., & Strickroth, T. (2013). *Ecopsychology*, 5(1), 9-16.
- Manne, S. L., Taylor, K. L., Dougherty, J., & Kemeny, N. (1997). Supportive and negative responses in the partner relationship: Their association with psychological adjustment among individuals with cancer. *Journal of Behavioral Medicine*, 20(2), 101-125.
- Manning, M. (2009). The effects of subjective norms on behaviour in the theory of planned behaviour: A meta-analysis. *British Journal of Social Psychology*, 48(4), 649-705.
- Maio, G. R., Pakizeh, A., Cheung, W., & Rees, K. J. (2009). Changing, priming, and acting on values: Effects via motivational relations in a circular model. *Journal of Personality and Social Psychology*, 97(4), 699-715.
- Matiasko, W., Menges, R., & Spiess, M. (2012). Modifying the rebound: It depends! Explaining mobility behavior on the basis of the German socio-economic panel. *Energy Policy*, 41, 29-35.
- Mazar, N., & Zhong, B. (2010). Do green products make us better people? *Psychological Science*, 21, 4, 494-498.
- Mead, G. H. (1934). *Mind, Self, and Society: From the Standpoint of a Social Behaviorist*. University of Chicago Press.
- Merriam-Webster Dictionary. (2012) Emotion. Retrieved from <http://www.merriam-webster.com/dictionary/emotion>
- Meeker, D., Linder, J. A., Fox, C. R., Friedberg, M. W., Persell, S. D., Goldstein, N. J., Knight, T. K., Hay, J. W., & Doctor, J. N. (2016). Effect of behavioral interventions in inappropriate antibiotic prescribing among primary care practices: A randomized clinical trial. *JAMA*, 315(6), 562-570.
- Mellström, C., & Johannesson, M. (2008). Crowding out in blood donation: Was Titmuss right? *Journal of the European Economic Association*, 6(4), 845-863.
- Meltzoff, A. N. (1995). Understanding the intentions of others: Re-enactment of intended acts by 18-month-old children. *Developmental Psychology*, 31(5), 838-850.
- Meltzoff, A. N., & Moore, N. K. (1997). Explaining facial imitation: A theoretical model. *Early Development and Parenting*, 6, 197-192.
- Milgram, S., Bickman, L., & Berkowitz, L. (1969). Note on the drawing power of the crowds of different size. *Journal of Personality and Social Psychology*, 13, 79-82.
- Morris, M. W., Hong, Y., Chiu, C., & Liu, Z. (2015). Normology: Integrating insights about social norms to understanding cultural dynamics. *Organizational Behavior and Human Decision Processes*, 129, 1-13.

- Mullen, E., & Monin, B. (2016). Consistency versus licensing effects of past moral behavior. *Annual Review of Psychology*, 67, 363-385.
- Mulligan, K., & Scherer, K. R. (2012). Toward a working definition of emotion. *Emotion Review*, 4(4), 345-357.
- Nik Ramli, N. A. R., & Naja, M. (2011). Spillover in environmentally friendly behavior phenomenon: The mediation effect of employee organizational identification. *International Journal of Sustainable Development*, 1(12), 29-42.
- Nik Ramli, N. A. R., & Naja, M. (2012). A discussion of underlying theories explaining the spillover in environmental friendly behavior phenomenon. *Social and Behavioral Science*, 50, 1061-1072.
- Nilsson, A., Bergquist, M., & Schultz, P. W. (2016). Spillover effects in environmental behaviors, across time and context: A review and research agenda. *Environmental Education Research*, 23(4), 573-589.
- Nilsson, A., & Martinsson, J. (2012). *Attityder till Miljöfrågor: Utveckling, Betydelse och Förklaringar*. Lund: Studentlitteratur.
- Nook, E. C., Ong, D. C., Morelli, S. A., Mitchell, J. P., & Zaki, J. (2016). Prosocial conformity: Prosocial norms generalize across behavior and empathy. *Personality and Social Psychology Bulletin*, 42(8), 1045-1062.
- Nolan, J. M., Schultz, P. W., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2008). Normative social influence is underdetected. *Personality and Social Psychology Bulletin*, 34, 913-923.
- Nordlund, A. M., & Garvill, J. (2002). Value structures behind proenvironmental behavior. *Environment and Behavior*, 34(6), 740-756.
- Nordlund, A. M., & Garvill, J. (2003). Effects of values, problem awareness, and personal norm on willingness to reduce personal car use. *Journal of Environmental Psychology*, 23(4), 339-347.
- North, A. C., Hargreaves, D. J., & McKendrick, J. (1997). In-store music affects product choice. *Nature*, 390, 132.
- Novak, K. B., & Crawford, L. A. (2001). Perceived drinking norms, attention to social comparison information, and alcohol use among college students. *Journal of Alcohol and Drug Education*, 46(3), 18-33.
- Oceja, L., & Berenguer, J. (2009). Putting text in context: The conflict between pro-ecological message and anti-ecological descriptive norms. *The Spanish Journal of Psychology*, 12(2), 657-666.
- OECD/IEA. (2016). http://www.iea.org/media/statistics/Recent_Trends_in_the_OECD.pdf
- Pennebaker, J. W., & Sanders, D. Y. (1976). American graffiti: Effects of authority and reactance arousal. *Personality and Social Psychology Bulletin*, 2(3), 264-267.
- Pendry, L., & Carrick, R. (2001). Doing what the mob do: Priming effects on conformity. *European Journal of Social Psychology*, 31(1), 83-92.
- Phelps, E. A. (2006). Emotion and cognition: Insights from studies of the human amygdala. *Annual Review of Psychology*, 57, 27-53.
- Pratto, F., & Bargh, J. A. (1991). Stereotyping based on apparently individuating information: Trait and global components of sex stereotypes under attention overload. *Journal of Experimental Social Psychology*, 27(1), 26-47.
- Premack, D., & Woodruff, G. (1978). Does the chimpanzee have a theory of mind? *Behavioral and Brain Science*, 1(4), 515-526.

- Reese, G., Loew, K., & Steffgen, G. (2014). A towel less: Social norms enhance pro-environmental behavior in hotels. *The Journal of Social Psychology, 154*, 97-100.
- Reeve, J., & Deci, E. L. (1996). Elements of the competitive situation that affect intrinsic motivation. *Personality and Social Psychology Bulletin, 22*(1), 24-33.
- Reeves, B., Cummings, J. J., Scarborough, J. K., & Yeykelis, L. (2015). Increasing energy efficiency with entertainment media: An experimental and field test of the influence of a social game on performance of energy behaviors. *Environment and Behavior, 47*(1), 102-115.
- Reich, J. W. & Robertson, J. L. (1979). Reactance and norm appeal in anti-littering messages. *Journal of Applied Social Psychology, 9*(1), 91-101.
- Reno, R. R., Cialdini, R., & Kallgren, C. A. (1993). The transsituational influence of social norms. *Journal of Personality and Social Psychology, 64*(1), 104-112.
- Richetin, J., Perugini, M., Mondini, D., & Hurling, R. (2014). Conserving water while washing hands: The immediate and durable impacts of descriptive norms. *Environment and Behavior, 48*(2), 343-364.
- Rimal, R. N., & Real, K. (2005). How behaviors are influenced by perceived norms: A test of the theory of normative social behavior. *Communication Research, 32*(3), 389-414.
- Rizzolatti, G., & Arbib, M. A. (1998). Language within our grasp. *Trends in Neurosciences, 21*(5), 188-194.
- Rizzolatti, G., Fadiga, L., Gallese, V., & Fogassi, L. (1996). Premotor cortex and the recognition of motor actions. *Cognitive Brain Research, 3*(2), 131-141.
- Ro, M., Brauer, M., Kuntz, K., Shukla, R., & Bensch, I. Making cool choices for the sustainability: Testing the effectiveness of a game-based approach to promoting pro-environmental behaviors. *Journal of Environmental Psychology, 53*, 20-30.
- Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin III, F. S., Lambin, E. F., Lenton, T. M., Cheffer, M., Folke, C., Schellnhuber, H. J., Nykvist, B., de Wit, C. A., Hughes, T., van der Leeuw, S., Rodhe, H., Sörling, S., Snyder, P. K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R. W., Fabry, V. J., Hasnen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P., & Foley, J. A. (2009). A safe opening space for humanity. *Nature, 461*, 471-475.
- Rozin, P., Royzman, E. B. (2001). Negativity bias, Negativity Dominance, and Contagion. *Personality and Social Psychology Review, 5*(4), 296-320.
- Ruiter, R. A., Kessels, L. T. E., Peter, G. Y., & Kok, G. (2014). Sixty years of fear appeal research: Current state of the evidence. *International Journal of Psychology, 49*(2), 63-70.
- Russell, J. A., & Berrett, L. F. (1999). Core affect, prototypical emotional episodes, and other things called *emotion*: Dissecting the elephant. *Journal of Personality and Social Psychology, 76*(5), 805-819.
- Saroglou, V., Corneille, O., & Van Cappellen, P. (2009). "Speak, Lord, your servant is listening": Religious priming activates submissive thoughts and behaviors. *The International Journal for the Psychology of Religion, 19*(3), 143-154.
- Schultz, P. W. (1999). Changing behavior with normative feedback interventions: A field experiment on curbside recycling. *Basic and Applied Social Psychology, 21*(1), 25-36.
- Schultz, P. W. (2014). Promoting proenvironmental behavior. *European Psychologist, 1*-11.
- Schultz, P. W., Estrada, M., Schmitt, J., Sokoloski, R., & Silva-Send, N. (2015). Using in-home displays to provide smart meter feedback about household electricity

- consumption: A randomized control trial comparing kilowatts, cost, and social norms. *Energy*, *90*, 351-358.
- Schultz, P. W., Khazian, A. M., & Zaleski, A. C. (2008). Using normative social influence to promote conservation among hotel guests. *Social Influence*, *3*, 4-23.
- Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. *Psychological Science*, *18*, 429-434.
- Schultz, P. W., Messina, A., Tronu, G., Limas, E. F., Gupta, R., & Estrada, M. (2016). Personalized normative feedback and the role of personal norms: A field experiment to reduce residential water consumption. *Environment and Behavior*, *48*(5), 686-710.
- Schwartz, S. H. (1977). Normative influence on altruism. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology* (Vol. 10, pp. 221-279). New York: Academic Press.
- Schwartz, N., & Clore, J. L. (2007). Feelings and phenomenal experiences. In A. W. Kruglanski & E. T. Higgins (Eds.), *Social psychology: Handbook of basic principles* (Vol. 2). New York: Guilford Press.
- Shah, J. Y., Kruglanski, A. W., & Friedman, R. (2003). Goal systems theory: Integrating the cognitive and motivational aspects of self-regulation. In S. J. Spencer, S. Fein, M. P. Zanna, & J. M. Olson (Eds.), *Motivated social perception: The Ontario Symposium* (Vol. 9, pp. 247-275). Mahwah, NJ: Erlbaum.
- Shafir, E. (1993). Choosing versus rejecting: Why some options are both better and worse than others. *Memory and Cognition*, *21*(4), 546-556.
- Shafir, E. (2007). Decisions constructed locally: Some fundamental principles of the psychology of decision making. In A. W. Kruglanski & E. T. Higgins (Eds.), *Social psychology: Handbook of basic principles* (Vol. 2). New York: Guilford Press.
- Sherif, M. (1936). *The Psychology of Social Norms*. New York: Harper.
- Smith, J. R., Louis, W. R., Terry, D. J., Greenaway, K. H., Clarke, M. R., & Cheng, X. (2012). Congruent or conflicted? The impact of injunctive and descriptive norms on environmental intentions. *Journal of Environmental Psychology*, *32*, 353-361.
- Sorrell, S. (2009). Jevon's paradox revised: The evidence for backfire from improved energy efficiency. *Energy Policy*, *37*, 1456-1469.
- Steinhorst, J., & Klöckner, C. A. (2017). Effects of monetary versus environmental information framing: Implications of long-term pro-environmental behavior and intrinsic motivation. *Environment and Behavior*, 1-35.
- Steinhorst, J., Klöckner, C. A., & Matthies, E. (2015). Saving electricity – For the money or the environment? Risks of limiting pro-environmental spillover when using monetary framing. *Journal of Environmental Psychology* *43*, 125-135.
- Steg, L., Dreijerink, L., & Abrahamse, W. (2005). Factors influencing the acceptability of energy policies: A test of VBN theory. *Journal of Environmental Psychology*, *(25)4*, 415-425.
- Steg, L., Lindenberg, S., & Keizer, K. (2016). Intrinsic motivation, norms, and environmental behaviour: The dynamics of overarching goals. *International Review of Environmental and Resource Economics*, *9*, 179-207.
- Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, *(29)3*, 309-317.
- Stern, P. C. (2000). New environmental theories: Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, *(56)3*, 407-424.

- Stern, P. C., & Gardner, G. T. (1981). Psychological research and energy conservation. *American Psychologist*, 36(4), 329-342.
- Sussman, R. (2016). Observational methods: The first step in science. In Gifford, R. (Ed.), *Research Methods for Environmental Psychology*, (pp. 9-28). Wiley Blackwell.
- Sussman, R., & Gifford, R. (2012). Please turn off the lights: The effectiveness of visual prompts. *Applied Ergonomics*, 43(3), 596-603.
- Taylor, S. E. (1991). Asymmetrical effects of positive and negative events: the mobilization-minimization hypothesis. *Psychological Bulletin*, 110(1), 67-85.
- Termine, N. T., & Izard, C. E. (1988). Infants' responses to their mothers' expressions of joy and sadness. *Developmental Psychology*, 24(2), 223-229.
- Terrier, L., & Marfaing, B. (2015). Using social norms and commitment to promote pro-environmental behavior among hotel guests. *Journal of Environmental Psychology*, 44, 10-15.
- Terry, D. J., Hogg, M. A., & White, K. M. (1999). The theory of planned behaviour: Self-identity, social identity and group norms. *Journal of British Social Psychology*, 38(3), 225-244.
- Thøgersen, J. (2004). A cognitive dissonance interpretation of consistencies and inconsistencies in environmentally responsible behavior. *Journal of Environmental Psychology*, 24(1), 93-103.
- Thøgersen, J. (2006). Norms for environmental responsible behavior: An extended taxonomy. *Journal of Environmental Psychology*, 26(4), 247-261.
- Thøgersen, J., & Crompton, T. (2009). Simple and painless? The limitations of spillover in environmental campaigning. *Journal of Consumer Policy*, (32), 141-163.
- Thøgersen, J., & Noblet, C. (2012). Does green consumerism increase acceptance of wind power? *Energy Policy*, 51, 854 – 862.
- Thøgersen, J., & Ölander, F. (2003). Spillover of environment-friendly consumer behavior. *Journal of Environmental Psychology*, 23, 225-236.
- Tice, D. M. (1991). Esteem protection or enhancement? Self-handicapping motives and attributions differ by trait self-esteem. *Journal of Personality and Social Psychology*, 60(5), 711-725.
- Tiefenbeck, V., Staake, T., Roth, K., & Sachs, O. (2013). For better or for worse? Empirical evidence of moral licensing in a behavioral energy conservation campaign. *Energy Policy*, 57, 160-171.
- Tomasello, M., Carpenter, M., Call, J., Behne, T., & Moll, H. (2005). Understanding and sharing intentions: The origins of cultural cognition. *Behavioral and Brain Sciences*, 28(5), 675-691.
- Touré-Tillery, M., Fishbach, A. (2014). How to measure motivation: A guide for the experimental social psychologist. *Personality and Social Psychology Compass*, 8(7), 328-341.
- Tudor, T. L., Barr, S. W., & Gilg, A. W. (2007). Linking intended behavior and actions: A case of healthcare waste management in the Cornwall NHS. *Resources, Conservation, and Recycling*, 51(1), 1-23.
- Triplett, N. (1898). The dynamogenic factors in pacemaking and competition. *The American Journal of Psychology*, 9(4), 507-533.
- Truelove, H. B., Carrico, A. R., Weber, E. U., Raimi, K. T., and Vandenbergh, M. P. (2014). Positive and negative spillovers of pro-environmental behavior: An integrative review and theoretical framework. *Global Environmental Change*, 29, 127-138.

- Törnblom, K. T., & Biddle, B. J. (1979). Prescriptions and proscriptions: A taxonomy and a field experiment on conformity effects. *European Journal of Social Psychology*, 6(1), 111-114.
- Valente, T. W. (2001). Evaluating communication campaigns. In Atkins, C.K. & Rice, R.E. (2001). *Public Communication Campaigns*. (3ed), Newbury Park, CA: Sage
- van der Werff, E. Keizer, K., & Steg, L. (2014). I am what I am, by looking past the present: The influence of biospheric values and past behavior on environmental self-identity. *Environment and Behavior*, 46(5), 626-657.
- van der Werff, E., & Steg, L. (2015). One model to predict them all: Predicting energy behaviours with the norm activation model. *Energy Research & Social Science*, 6, 8-14.
- Van der Werff, E., Steg, L., & Keizer, K. (2013). It is a moral issue: The relationship between environmental self-identity, obligation-based intrinsic motivation and pro-environmental behaviour. *Global Environmental Change*, 23(5), 1258, 1265.
- Venhoeven, L. A., Bolderdijk, J. W., & Steg, L. (2016). Why acting environmental-friendly feels good: Exploring the role of self-image. *Frontiers in Psychology*, 7, 1846.
- Vohs, K. D., Mead, N. L., & Goode, M. R. (2006). The psychological consequences of money. *Science*, 314, 1154-1156.
- von Borgstede, C., Dahlstrand, U., & Biel, A. (1999). From ought to is: Moral norms in large-scale social dilemmas. *Göteborg Psychological Reports*, 29, 1-17.
- Walker, E. L. & Heyns, R. W. (1962). *An Anatomy for Conformity*. Engelwood Cliffs, N.J.: Prentice-Hall.
- White, K., & Simpson, B. (2013). When do (and don't) normative appeals influence sustainable consumer behaviors? *Journal of Marketing*, 77(2), 78-95.
- Willis, H. R. (1961). Social influence and conformity: Some research perspectives. *Acta Sociologica*, 5(2), 100-114.
- Winter, P. L. Sagarin, B. J., Rhoads, K., Barrett, D. W., & Cialdini, R. B. (2000). Choosing to encourage or discourage: Perceived effectiveness of prescriptive versus proscriptive messages. *Environmental Management*, 26(6), 589-594.
- Zhong, C. B., & Leonardelli, G. J. (2008). Cold and lonely: Does social exclusion literally feel cold? *Psychological Science*, 19(9), 838-84.
- Öhman, A., Flykt, A., & Esteves, F. (2001). Emotion drives attention: Detecting the snake in the grass. *Journal of Experimental Psychology: General*, 130(3), 466-478.

Appendix A: an additional Experiment in Study 1.

This Experiment were conducted as a first Experiment in Study I in order to explore if and how framing a normative versus a gain goal would activate personal norms and attitudes for energy conservation. The Experiment was dropped in the review process. I choose to report this Experiment as the results may provide justifications for why we expected contest-based and norm-based interventions to affect personal norms and complement Study I in showing that personal norms can be activated as a consequence of normative goal-framing.

Background. To explore goal-framing in the two intervention techniques, this Experiment primed competitiveness and cooperativeness, as corresponding elements of contest-based and norm-based intervention techniques, which were expected to frame a gain goal and a normative goal, respectively. If these primes frame a gain- versus a normative goal, stronger

normative considerations are expected when cooperativeness are primed than when competitiveness are primed. Because pro-environmental behavior is associated with the normative goal frame, these normative considerations was measured by stronger personal energy conservation norms and attitude. Furthermore, because energy conservation can be perceived either as a means to save money or as a collective norm, which is a form of goal framing, we also wanted to test whether these descriptions of energy conservation would moderate priming.

Method. Sixty participants (56.7% males) in the USA were recruited through MTurk program. Qualtricsr randomly assigned participants in a 2 (goal frame: competitiveness vs. cooperativeness) \times 2 (energy conservation description: individual-economic benefit vs. collective-environmental benefit) between-groups design. The stimulus material consisted of three pictures of individuals either competing or cooperating. Participants were exposed to these three pictures, one at a time, instructed to imagine that they were one specific person in the picture, and asked to describe "...your goals and how you feel." Participants then rated attitude and personal norms concerning energy conservation. Energy conservation was described as either an individual-economic benefit "*I can make money by saving household energy...*" or a collective-environmental benefit "...acting together to save household energy is...".

Results and Discussion. First, our manipulation-check confirmed that participants assigned to the competition condition ($M = 7.63$, $SD = 1.29$, $n = 26$) felt more competitive, while participants assigned to the cooperation condition ($M = 4.0$, $SD = 2.15$, $n = 32$) felt more cooperative, $t(38.9) = 7.55$, $p < .001$, $d = 2.1$, 95% CI [1.46, 2.74]. Second, two 2 (priming: competitiveness vs. cooperativeness) \times 2 (energy saving description: individual-economic benefit vs. collective-environmental benefit) factorial analyses of variances (ANOVA's) on ratings of attitude and personal energy conservation norms were conducted. Results revealed a main effect of priming on personal energy conservation norms, $F(1, 53) = 4.72$, $p = .034$, $\eta_p^2 = .082$, showing that participants primed with cooperation reported stronger personal energy conservation norms ($M = 7.85$, $SD = 1.38$) than participants primed with competition ($M = 7.03$, $SD = 1.5$). It was also found that participants primed with cooperation tended to report more positive attitude towards energy conservation than participants primed with competition ($d = 0.41$, 95% CI [-0.17, 0.93]). No significant effect of energy conservation description was found, indicating that priming competition versus cooperation independently framed a gain versus a normative goal.

Taken together, these data indicate that priming cooperation framed a normative goal which activated participants' personal energy conservation norms. However, these goals were framed by an engagement in a contest-based versus norm-based intervention. Therefore, Experiment 2 further examined the role of goal-framing in the two intervention techniques.

Appendix B: additional analysis in Study IV, Experiment 2.

As the composite construct of reactance showed low reliability ($\alpha = .55$), in Experiment 2, Study IV, repeated-measures ANOVA's were conducted for each item. First, a 2 (picture: prescriptive vs. proscriptive) vs. 2 (text: prescriptive vs. proscriptive) repeated-measures ANOVA was conducted on ratings for the item "Is the sign perceived as demanding?" In line with H3 and H4, the analysis found a main effect of text ($F(1, 174) = 110.74$, $p < .001$, $\eta_p^2 =$

.39), and a main effect of picture ($F(1, 174) = 16.23, p < .001, \eta^2_p = .09$, see Figure 5). Descriptive statistics showed that reactance was highest for the proscriptive prompt ($M = 4.80, SD = 1.62$) and lowest for the prescriptive prompt ($M = 2.94, SD = 1.52$).

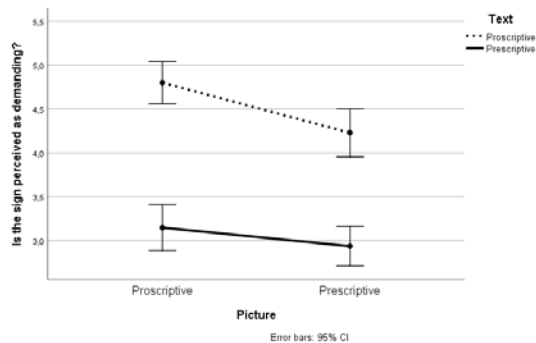


Figure 5. Rated reactance measured by the item “Is the sign perceived as demanding?” for the four prompts.

Second, a 2 (picture: prescriptive vs. proscriptive) vs. 2 (text: prescriptive vs. proscriptive) repeated-measures ANOVA was conducted on ratings for the item “Do you feel like overlooking the sign?” In line with H3 and H4, the analysis found a main effect of text ($F(1, 181) = 53.02, p < .001, \eta^2_p = .23$), and a main effect of picture ($F(1, 181) = 10.62, p = .001, \eta^2_p = .06$). However, for this item a significant interaction was also found ($F(1, 181) = 10.10, p = .002, \eta^2_p = .05$, see Figure 6). Descriptive statistics showed that reactance was lowest for the prescriptive prompt ($M = 2.24, SD = 1.61$), but the proscriptive prompt ($M = 3.55, SD = 1.76$) did not differ from the prompt combining proscriptive picture and prescriptive text ($M = 3.53, SD = 1.94$), suggesting that the proscriptive text elicited reactance both when combined with the proscriptive and prescriptive picture. Taken together, results of analyzing reactance using each item were generally in line with the results when using the composite construct of reactance.

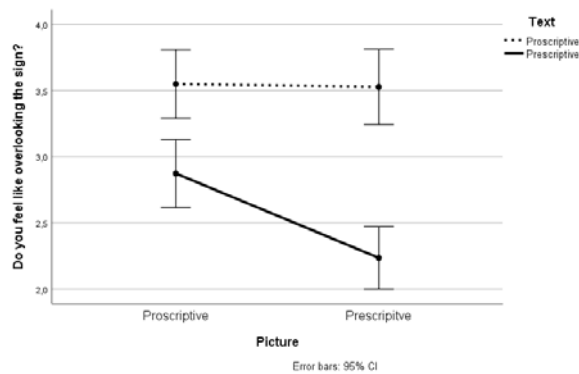


Figure 6. Rated reactance measured by the item “Do you feel like overlooking the sign?” for the four prompts.

Third, a 2 (picture: prescriptive vs. proscriptive) vs. 2 (text: prescriptive vs. proscriptive) repeated-measures ANOVA was conducted on ratings for the item “Is the sign perceived as

forceful?” In line with H3 and H4, the analysis found a main effect of text ($F(1, 182) = 175.37, p < .001, \eta^2_p = .49$), and a main effect of picture ($F(1, 182) = 24.31, p < .001, \eta^2_p = .12$, see Figure 7). Descriptive statistics showed that reactance was highest for the proscriptive prompt ($M = 4.64, SD = 1.67$) and lowest for the prescriptive prompt ($M = 2.44, SD = 1.35$).

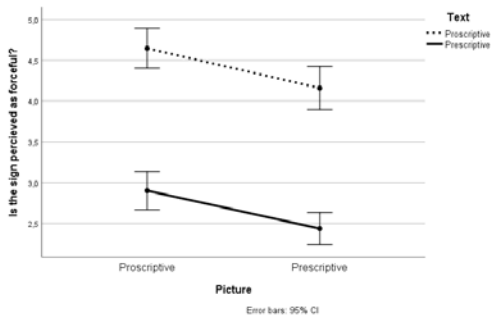


Figure 7. Rated reactance measured by the item “Is the sign perceived as forceful?” for the four prompts.