**Introduction**

Masses of people today are living lifestyles abundant in consumption (Matsuyama, 2002; Trentmann, 2004), and this consumption is driving the planet towards becoming a more inhospitable place to live (Hoekstra & Wiedmann, 2014; IPCC, 2014; Ripple et al., 2019). Lifestyles are patterns of behavioral choices that are steered by human psychological tendencies (Dean et al., 1995). Thus, a psychological approach is key for gaining insights into how high-consumption lifestyles can be altered. Specifically, one of the psychological tendencies that drives people’s behavior is their proneness to adapt their behavior to match prevailing norms in their group (Miller & Prentice, 2016). The purpose of the current project is to develop and test a psychological intervention that changes people’s perception of prevailing consumption norms to reduce their consumption.

People engage in many consumer activities on a daily basis, like heating and cooling their homes, driving in personal cars, and purchasing food and clothing, that generate, and provide demand for the generation of, massive amounts of greenhouse gas (GHG) emissions (Hertwich & Peters, 2009; Ivanova et al., 2015). These GHGs accumulate in the Earth’s atmosphere, leading to warmer global temperatures, rising sea levels, more extreme weather events, and ultimately a planet that is more threatening to human safety and sustainability. By 2100, if no additional mitigation efforts are made, we are projected to live in a world that is 3.7°C to 4.8°C warmer than it was during the pre-industrial era, which would manifest in severe environmental consequences for many people (IPCC, 2014). To avoid this, the Intergovernmental Panel on Climate Change (IPCC) has set the goal to limit warming to 1.5°C by reducing human emissions to zero by 2050.

There are two main climate-change mitigation approaches: supply- and demand-sided strategies. Demand-sided strategies involve reducing demand for products and services that generate GHG emissions (e.g., by reducing high-consumption lifestyles). Supply-sided strategies involve reducing the supply of GHGs to the atmosphere by altering manufacturing processes to produce goods and services in ways that do not emit GHGs and by expanding technological innovations like carbon capture, which removes GHGs from the atmosphere, and renewable energy sources, which provide energy while producing little to no GHGs (IPCC, 2018). Supply-sided solutions are enticing because they do not involve people having to change their current lifestyles and can coincide with economic growth. Despite their appeal, though, they also have significant weaknesses that suggest they will not, on their own, be enough to prevent alarming levels of warming from occurring (Hoekstra, 2014; IPCC, 2018).

For example, there is great uncertainty regarding whether carbon capture technologies can scale quickly enough to remove the amounts of GHGs from the atmosphere that are needed to reduce emissions to zero by 2050. Furthermore, to meet operation costs, carbon capture companies sell carbon dioxide to oil companies to be used for enhanced oil recovery, a process of injecting CO2 underground to extract oil more effectively, which results in increased emissions (Kolster et al., 2017). It is unclear whether carbon capture companies will be able remove the gigatonnes of CO2 that are currently in the atmosphere in addition to being able to offset the increase in emissions that result from this business practice. As stated by the IPCC (2018), carbon capture “deployed at scale is unproven, and reliance on such technology is a major risk in the ability to limit warming to 1.5°C.”

Furthermore, consumers could argue that the responsibility for reducing GHG emissions is not on individuals to accomplish by changing their lifestyles, but rather is on corporations because they have both produced and profited from the production of GHGs. This approach would mean relying on companies to invest resources, very quickly, into decarbonizing their supply chains. However, our high-consumption lifestyles make corporations’ current infrastructures very profitable (US Census Bureau, 2022). Companies have shown less motivation to invest in making changes to improve the sustainability of their manufacturing processes when these changes were not associated with financial benefits (O’Rourke, 2014). That being so, current consumption practices likely create little incentive for corporations to make costly investments in restructuring their supply chains, much less at the scale and speed that is necessary to reach net-zero emissions in 27 years. Thus, by themselves, technological innovations and corporate transformations are very unlikely to mitigate the climate crisis.

Given these limitations, demand-sided strategies are increasingly being seen as a necessary part of the climate solution (Creutzig et al., 2018). Specifically, there is rising interest in how reductions can be made in people’s levels of consumption (Druckman & Jackson, 2010; Dubois et al., 2019; Girod, van Vuuren, & Hertwich, 2014; Wiedmann, Lenzen, Keyβer, & Steinberger, 2020). The purpose of the current project is to investigate how psychological interventions can be used to encourage people to reduce the amount of consumption they engage in. The field of social psychology already has an established history of developing interventions aimed at encouraging people to adopt more environmentally-friendly behaviors. One of the most commonly used approaches is the norm intervention (Bohner & Schlüter, 2014; Carrico & Riemer, 2011; Cialdini, Reno, & Kallgren, 1990; Cialdini et al., 2006; de Groot, Abrahamse, & Jones, 2013; Dwyer, Maki, & Rothman, 2015; Ferraro, Miranda, & Price, 2011; Goldstein, Cialdini, & Griskevicius, 2008; Handgraaf, Van Lidth de Jeude, & Appelt, 2013; Kallgren, Reno, & Cialdini, 2000; Lapinski, Rimal, DeVries, & Lee, 2007; Melnyk, Herpen, Fischer, & van Trijp, 2011; Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008; Oceja & Berenguer, 2009; Reese, Loew, & Steffgen, 2014; Reno, Cialdini, & Kallgren, 1993; Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007; Schultz, Khazian, & Zaleski, 2008; Smith et al., 2012).

“Norms” have been defined as the behavioral rules understood by members of a group that guide or constrain group members’ behaviors (Cialdini & Trost, 1998) and that are upheld by people’s expectations that the rules are endorsed by other members of their group (Bicchieri, 2006). Norm interventions work by altering people’s perception of the norms that are endorsed by the people around them. This type of intervention has been able to produce significant increases in people’s willingness to adopt more environmentally-friendly practices across a number of different behaviors (e.g., recycling, conserving water and energy, and reusing towels) (Goldstein et al., 2008; Lapinski et al., 2007; Nolan et al., 2008; Schultz, 1999). Additionally, norm interventions are low cost and easy to implement to large audiences, which make them potentially a very valuable psychological tool to use for climate mitigation. However, sometimes the effects of norm interventions are inconsistent across studies, and they often produce small effect sizes, which suggests that there is room for norm interventions to be improved upon.

In the following sections of this introduction, I will 1) review the characteristics of currently used norm interventions in order to identify their strengths and weaknesses, 2) suggest methodological changes that might improve the efficacy of norm interventions, and 3) explain how these changes are being implemented to develop and test novel norm-intervention conditions in the current project.

**Shared Characteristics of Current Norm Interventions**

Currently used norm interventions share three notable characteristics. First, norm intervention conditions typically rely on the descriptive-injunctive norm dichotomy. Descriptive norms are frequently defined as behaviors that people perceive as being widely adopted by their group, while injunctive norms describe behaviors that people think others believe *ought* to be widely adopted (Cialdini, Reno, & Kallgren, 1990). In norm-intervention studies, the descriptive norm condition often takes the form of a normative message that informs participants that a majority of other people around them engage in a particular pro-environmental behavior (e.g., “85% of people in your neighborhood recycle”). The injunctive norm condition is often a normative message that informs participants that a majority of other people around them believe that it is *right* to engage in a pro-environmental behavior (e.g., “85% of the people in your neighborhood approve of people who recycle”).

These are the two types of norms that are most often manipulated in norm-intervention studies. Farrow et al. (2017) performed a review of norm-intervention studies to summarize their overall effectiveness on pro-environmental behaviors. Of 23 norm-intervention studies reviewed, 13 included a descriptive norm condition, five included an injunctive norm condition, and five included a condition that combined a descriptive and injunctive norm. Only one study in the review included a norm-intervention condition that was not either a descriptive or injunctive norm.

This shared characteristic is worth noting because more types of norms exist beyond just descriptive and injunctive norms. Different types of norms have different persuasive powers, and the effectiveness of a norm-intervention condition could depend on the type of norm that is manipulated. In fact, in Farrow et al. (2017), they found that descriptive norms produced significant, positive changes in people’s willingness to engage in pro-environmental behaviors more often than did injunctive norms. In the following sections, I will elaborate further on how the current project is developing and testing novel norm-intervention conditions based on types of norms that have not been previously investigated.

A second characteristic shared among norm intervention studies is that they most often contextualize the behavior that they want people to adopt as being in pursuit of, or aligned with, pro-environmental goals. This is called pro-environmental framing. For instance, in a study attempting to promote towel reuse among hotel guests, the descriptive norm message read, “Join your fellow guests in *helping to save the environment*. Almost 75% of guests who are asked to participate in our new resource savings program do help by using their towels more than once” (Goldstein et al., 2008). In a study aimed at reducing plastic bag usage in supermarkets, grocery patrons read an injunctive norm message that said, “Shoppers in this store believe that re-using shopping bags is *a worthwhile way to help the environment*. Please continue to re-use your bags” (de Groot, Abrahamse, & Jones, 2013). In a study investigating how to promote energy conservation behaviors, the descriptive norm condition stated, “About 90% of people reported *taking steps to conserve* in the year prior to this study” (Lapinski et al., 2007).

This framing results in the question of whether to adopt a pro-environmental behavior being seen as a social dilemma pitting one’s short-term self-interests against the long-term interests of the group (Nordlund & Garvill, 2003). That is, messages like these encourage people to adopt behaviors with long-term sustainability benefits that are in the short-term less convenient, less indulgent, and/or less immediately gratifying for the individual. It is likely that, when no effort is made to recontextualize them, pro-environmental behaviors are automatically interpreted as behaviors that require some degree of self-sacrifice for the sake of the group or the environment. This is supported by correlational evidence which finds that pro-environmental and self-transcendence values consistently, positively predict willingness to engage in pro-environmental behaviors (Ghazali et al., 2019; Hansla et al., 2008; Liobikiene & Juknys, 2016; Nordlund & Garvill, 2002, 2003; Poortinga et al., 2004), whereas self-enhancement values negatively predict endorsement of pro-environmental behaviors (Nordlund & Garvill, 2002; Poortinga et al., 2004). In the following sections, I will discuss how using a pro-environmental framing which pits self-interest against interests of the group could be reducing the potential strength of norm interventions. I will also explain how the effectiveness of a self-enhancing framing, which recontextualizes the adoption of a pro-environmental behavior as being consistent with one’s self-interest, is being tested in the current project.

The third characteristic that is shared among norm-intervention studies is that they do not attempt to address people’s motivations to engage in environmentally *un*friendly behaviors. Rather, studies aimed at promoting pro-environmental behaviors suggest that people should adopt these behaviors *in spite of* their current desires to do otherwise. For example, in a study aimed at promoting better recycling habits, participants were given weekly information about the recycling behaviors of their neighbors, which established expectations regarding how much recycling was normative in their neighborhood (Schultz, 1999). There was no mention of the factors that are associated with people’s desire to *not* recycle, like that recycling is seen as confusing and inconvenient (Roy, Berry, & Dempster, 2022). The rationale for this approach seems to be that we can rely on the persuasive appeal of norms, which apply social pressure by demonstrating which behaviors are normative, effective and/or (un)desirable (Cialdini et al., 2006), to override pre-existing motivations.

However, this approach could mean that norm interventions are creating competing motivations within individuals. On the one hand, people may be motivated to adopt a pro-environmental behavior to conform with social pressures, but on the other, they could desire to still have the benefits that come with engaging in their environmentally unfriendly habits. This could be one reason why norm interventions often produce small effects and are more effective among people high on group orientation (and thus are potentially more susceptible to the influence of group norms) compared to people low on group orientation (Lapinski et al., 2007). Norm interventions could be strengthened, and appeal to a wider audience, by taking into consideration the factors that motivate people’s already-existing habits. In the following sections, I will elaborate on what social goals motivate people’s consumption behaviors and how the current project tests the efficacy of norm-intervention conditions that communicate how these desired social goals can be met by *reducing* one’s level of consumption.

**Suggested Methodological Changes to Norm Interventions**

In the following sections, I will elaborate further on how the current project is developing and testing novel norm-intervention conditions based on types of norms that have not been previously investigated.

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**Current Project**