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Installations for Civic Culture: Behavioral Policy Interventions to Promote Social Sustainability

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Abstract: Achieving more equitable, safer, and resilient societies—crucial dimensions of social sustainability—depends on durable transformations in people's behavior. Traditional policy interventions attempt to influence people's behavior in different ways, such as increased policing, fines, or awareness campaigns, but often have limited effects because they fail to systematically address local determinants of behavior. In this paper, we analyze two complex behavioral policy interventions to illustrate how installation theory can provide a framework to systematically analyze and design for large-scale behavioral change to support social sustainability. We focus on two of Antanas Mockus' iconic "civic culture" interventions to reduce deaths in traffic accidents and domestic violence in Colombia. To study them, we collected intervention reports, citizens' narratives, creators' accounts and press articles to identify their main characteristics and behavioral techniques. In our results, we find that the civic culture approach used in these two interventions addresses physical, psychological and social determinants of behavior in ways that reduce reactance and promote mutual regulation and collective agency. By unraveling the essential factors of behavioral influence, installation theory and related frameworks provide a useful guide to structure, analyze and report interventions that address the behavioral components of social sustainability.

Keywords: installations; social sustainability; civic culture; behavioral change; policy

1. Introduction

Attaining social sustainability goals remains a considerable challenge in modern societies, as they require long-lasting transformations in complex collective trends of behavior. The design of cost-effective and sustainable behavioral change often involves profound shifts in complex socio-technical environments, social reproduction processes and power relations. This rarely happens spontaneously: behavioral transformations must be carefully planned and implemented to avoid changes in legislation, policy and systems that do not translate to transformations in the everyday actions of people (which is ultimately where most of the impact of such initiatives should translate to). Nonetheless, traditional policy interventions have often failed to successfully integrate, address and redesign local behavioral determinants, given the large heterogeneity in the way behavior change is generated across local contexts, groups and societies [1]. This challenge points to the need to develop, analyze and test practical frameworks to analyze, transform and evaluate interventions that can promote large-scale behavioral change that supports social and environmental sustainability. Installation theory [2–4] provides a promising framework to analyze and redesign socio-technical environments and systems in order to promote large-scale behavioral changes that inform social sustainability goals. This is because it offers the tools to systematically conceptualize and analyze the physical, psychological, and

social determinants of behavior at their point of enactment. The detailed understanding of the underlying mechanisms that channel and support behavior in local contexts can shed light on how interventions can produce a large and persistent impact on social sustainability goals. This applies both to informing the design of new interventions and policies that address current behavioral determinants, and also to the analysis of past or current policy interventions that aim to influence people's behavior.

To examine how the installation theory framework can inform a systematic approach to large-scale behavioral transformation in complex contexts, in this paper we focus on two behavioral policy interventions that were successful in creating large-scale transformations for complex challenges in ways that are rarely seen in the policy or behavioral fields. While the two interventions were not originally designed with the installation theory framework in mind, we follow a "forensic" approach to unearth how the original interventions understood and redesigned physical, psychological and social determinants of behavior in local contexts to produce large-scale behavioral change that promotes social sustainability. The first intervention of study is Antanas Mockus' mime-artist intervention in Colombia's capital, Bogota, which employed over 200 artists to promote traffic norms among pedestrians and drivers when using pedestrian crossings [5–8]. The mimes promoted positive collective behavior change by gently mocking norm-violators and praising norm compliers, while providing people with "civic cards" they could use to regulate others. The second intervention of study is the civic culture campaign called "Because Nothing Justifies Mistreatment" (BNJM), that significantly reduced domestic violence in a smaller Colombian city, Barrancabermeja [9,10]. Designers of the intervention created a systematic approach involving a 24-h hotline to deal with jealousy, hidden actors in the streets, the productions of popular songs and other cultural products, training programs and home visits, while also providing citizens with "whistles against abuse" to regulate others. More interestingly, both interventions generated mutual regulation among citizens while reducing the negative externalities for pedestrians, drivers, families and their communities. As we will review in the remainder of this paper, intervention designers accomplished such complex social behavioral change through an innovative approach that integrate well with the three layers of the installation theory.

After this short introduction, the remainder of this Section 1.1 provides the background of the study. It presents the relevant frameworks from the literature in which this work is inserted, including the social sustainability framework, installation theory and environmental frameworks for behavioral change, behavioral change techniques and mechanisms, before describing in more detail the specific context of the two civic culture interventions of interest. Section 2 explains the methodological approach and instruments used. Section 3 presents the results. Finally, Section 4 discusses our findings in the broader debate around nudging and more restricted perspectives on behavioral change.

1.1. Background: Literature Review and Context

In this section we present the literature review in four subsections. First (Section 1.1.1), we discuss the concept of social sustainability and its operationalization in terms of risk under the social sustainability framework (SSF) [11]. This framework provides an interesting conceptualization to better understand the risks of traffic norms and domestic violence in modern societies. It improves the understanding of socially "risky" behaviors by integrating the ecological aspects of the social and economic components that influence their evolution. Then (Section 1.1.2), we describe installation theory [2,3] (and compatible frameworks of behavioral change) as a framework to systematically understand and redesign local determinants of behavior that are linked to social sustainability challenges. In (Section 1.1.3), we discuss frameworks that describe behavioral change techniques and mechanisms, which are essential but often overlooked components of intervention design and reporting efforts. Finally (Section 1.1.4), the last subsection presents the case that will be the object of analysis in this paper: the civic culture interventions of mayor Antanas Mockus in Colombia [12].

1.1.1. The Social Sustainability Framework

Building on conventional sustainable development approaches, the Social Sustainability Framework (SSF) aims to better understand and protect against the dangers of tangible or potential phenomena and their consequent direct effects on societies [13–19]. In this way, this new conceptual framework envisions a set of actions and decisions that facilitates achievement of a more sustainable future. Its power focuses on reconceptualizing the future in newer forms and values that consolidate the social angle in clearer ways than previous frameworks [13,14,20].

Eizenberg and Jabareen [11] present an interesting base of analysis where risk is the ontological foundation. They define "risk" as the constitutive concept of sustainability thinking and practices in terms of the probability of a life-threatening negative externality to our species. The fundamental theoretical premise of this approach is to promote sustainable goals that incorporate mechanisms to minimize or adapt against those risks in people, groups and communities [11,21]. It promotes an individual impulse to make change, as one's own survival is at risk given the problematic behavior(s) [11,14].

Four interconnected components, each with a specific function, shape the social sustainability framework, and are presented below.

- Equity. The set of social, economic, and environmental policies that promote justice and fairness across societies [21–23]. It aims to reduce inequalities to minimize the alienation of people from their livelihoods and increase motivated action toward mitigating environmental risks. Thus, it emphasizes the need for justice in society and the economy when pursuing sustainable policies that address the behavioral change of interest [9,24,25]. The impacts may be unevenly distributed across societies, so that resilience resources are also unequally distributed, meaning that not all individuals and groups have the same capacity to adapt to the changing needs [21,24,26]. This makes equity one the most salient features of social sustainability (intergenerational and intragenerational equity are two important features to ensure fair allocation of resources between and within generations [21,23]), with the hallmarks of redistribution, recognition and participation [26].
- Safety. Refers to protection, security and safety in situations of vulnerability around the behavioral change of interest. Such effects will have huge implications in societies through physical exposure, government institutions, technological development, social networks and their implications on the development paths across communities [11,27]. The capacity to safely adapt and mitigate the dangers of these situations varies across individuals and groups and especially across communities and neighborhoods [11].
- Sustainable Urban Forms. The contemporary design and planning of cites must be reconceptualized around sustainability processes as a consequence of the increasing urbanization of human societies. The redesign of physical and urban planning is needed to achieve social sustainable societies, mitigate environmental risks and enhance wellbeing in line with the requirements of our modern communities [11,28,29].
- Eco-prosumption. A reorganization of the modern modes of consumption and production practices to encompass more sustainable, eco-friendly and community-oriented practices. These initiatives aim to reduce social risks such as scarcity, exploitation and alienation [30,31]. This dimension stipulates that more complex, collaborative and responsible approaches of economic and social organization will reduce the risks of the negative consequences around the behavioral change of interest [11,32,33].

In terms of our study, non-compliance to traffic norms and domestic violence harm the development of our communities as they resist the fundamentals of the SSF. Violations to traffic norms affect the concepts of equity, safety and sustainable urban forms in different ways. Pedestrians and drivers will not experience equitable environments if their peers do not follow the same rules. This disparity in peer behavior generates unequal outcomes leading to lower levels of fairness and justice when moving across the city. "Free-rider" users will benefit more at the cost of "cooperative" residents. At

the same time, this situation reduces the right to safety and security as it increases the environmental likelihood of traffic injuries, deaths, accidents, and their accompanying cost of repairs of vehicles, roads and medical equipment. Traffic norm violations also generate higher costs of repairs, environmental contamination and pollution, and traffic chaos which negatively impacts the aspirations integrated in the concepts of sustainable urban forms and eco-presumption. Both of which aim to generate more sustainable modes of living, consumption and production in line with social needs and environmental capabilities.

Domestic violence also represents an opposition to the concepts of the SSF. Aggression towards other household members does not comply with the right to safety and security. The risk of insecurity is especially high as most cases happen inside the privacy of one's home, which limits the options for prosecution, prevention or mitigation by police and official entities. Moreover, it is also fundamentally an equity challenge, as victims and aggressors often show stark gender divisions (as in the context we will study, where most cases were traced to jealous men using violence against their partners), which impacts gender-specific roles related to social and economic tasks. These two dynamics outlined above restrict the design, development and preservation of communities integrating the concepts of sustainable urban forms and eco-prosumption.

1.1.2. Installation Theory and Environmental Frameworks for Behavioral Change

Many crucial environmental and social sustainability goals are tied to achieving transformations in collective trends of behavior [34,35]. To be sustainable, such changes must be tied to transformations in the environments, social reproduction processes, and power relations in which behaviors occur. Installation theory [2,3] is a practical framework that guides the analysis and redesign of such processes. In contrast to more restricted frameworks [34,36], installation theory allows for the analysis and redesign of the complex socio-technical systems that support the social sustainability dimensions discussed above.

Installations [2,3] (p. 140) are "specific, local, societal settings where humans are expected to behave in a predictable way", such as restaurants, conference rooms, markets, streets, kitchens, living rooms, or even digital spaces. Installations represent patterns that assemble in space and time (in the fashion of artistic installations) to affect the way in which people experience situations, and to channel and support their activity. The process by which individuals' desires and intentions intermingle with the installation context is a continuous one; it is constantly reproduced, to effect and affect activity and behavior. Installation theory suggests that societies do not "reproduce as a whole, as an organism, as a structure, but point by point, locally, and at different local pace" [2] (p. 231).

These local activities that take place in installations are supported and channeled by three layers of determinants: the objective physical environment, the embodied interpretive systems, and social regulation. Different elements of these layers come together locally in installations to produce the expected behaviors that are crucial to support large-scale collaboration in complex societies, and that pass by the physical environments and objects that support and limit behavior (the physical layer), the embodied systems that allow people to learn and interpret what's going on and how they are supposed to act (the psychological layer), and the formal and informal regulation systems such as laws or social norms (the social layer). For a city to "work", for example, all kinds of strangers need to collaborate by following formal and informal rules. Partial compliance often creates social sustainability problems, as in the case of traffic norms or interpersonal violence [6].

As a behavioral analysis and intervention framework, installation theory offers several advantages compared to other popular frameworks which, while valuable, often offer a much more restricted view of human activity and social reproduction processes (see [37] for a scoping review). In this paper, we use the civic culture interventions (understood as large-scale behavioral policy interventions to promote social sustainability) as an example to illustrate some of those advantages, namely: (i) a focus on activity and behavior at its point of enactment (rather than abstract belief or attitude change, for example), and its link with broader social reproduction processes; (ii) a solid conceptualization of the main types of

factors that support and channel activity, and how they interact, complement and reinforce each other; and finally (iii) a practicable framework to systemically analyze and redesign local determinants of behavior. Our argument is that the civic culture interventions were relatively successful to promote large-scale behavioral changes to promote sustainability because they leveraged advantages (i) and (ii), which we aim to show by applying a forensic approach to advantage (iii).

Relatedly, there has been increasing recognition across the social and behavioral sciences that individual behavior and development occurs in embedded ecological systems comprising multiple levels of influence. One of the earliest and most influential proponents of this approach, Bronfenbrenner [38] specified an ecological systems model in which a child is influenced by a confluence of factors at multiple levels. These include the microsystem (e.g., peers, family, teachers), the mesosystem (e.g., the interaction of multiple microsystems such as a child's parents interacting with her schoolteachers), the exosystem (e.g., neighborhood, parent's workplace), the macrosystem (e.g., social and cultural norms and values), and the chronosystem (e.g., environmental and other historical changes over the life course). A simplified version of this approach, termed the socioecological model, specifies four main spheres of influence within which an individual is embedded: individual, relationship, community, and society [39]. A similar framework with multiple overlapping layers—the dynamic framework for social change—is used in the design of interventions to change harmful social norms, such as those related to the use of violence against children [40]. While incorporating the socioecological levels of influence, this framework uniquely centers gender and power at the nexus of overlapping ecological levels, which makes visible these dynamics hidden in other frameworks. In compatible developments, institutional change literature in economics has explored how collective behaviors are affected by changes in beliefs, mutual expectations and network configurations [41–44]. Each of these frameworks recognizes the multiple influences on behavior, which can guide the design of behavior change interventions for diverse areas such as violence prevention, creating healthier college campuses, improving geriatric health outcomes, agricultural safety, improving physical activity and creating sustainable business models, among many others [45–47]. They frame the different ecological levels of behavioral influence as interacting with and reinforcing one another, such that sustainable behavior change interventions are most effective when they account for these multiple influences simultaneously [48]. Indeed, we see the socioecological model as complementary to the three layers from installation theory, in that intervention components targeted at different ecological levels could incorporate behavior change techniques aimed at different layers. The layers provide a framework to map the relationship between intervention components at different levels, which is increasingly recognized as crucial for the design of effective and sustainable multilevel interventions [49].

Interventions must address and redesign the physical, psychological and social determinants and affordances that support current behaviors in order to effectively and sustainably transform them. While this has to be done in an opportunistic manner [3], balancing potential impact and available resources, the issue of exactly what type of techniques or actions are best suited to transform specific behaviors is still unresolved [6,34]. This pertains both to the content (for example, normative, factual or contextual information) and the modality (for example, radio ads, workshops or posters) of those actions, which in the behavioral science literature have generally been called behavioral change techniques [50].

Pursuing this logic within an installation theory framework results in two salient arguments that behavior change interventions cannot expect sustainable effects if: (1) they only seek to modify one of the three layers, and (2) they attempt to change behavior away from its time and place of enactment. This is because the installation theorist views behavior as locally determined by three layers of determinants in simultaneous action. Approaches that tend to focus overly on the physical (e.g., design-centered approaches and certain nudges, see [51]), overly on the psychological (e.g., efforts to change attitudes and beliefs only, see [52] (p. 5) or [53]), or overly on the social (e.g., social norms change interventions

providing only normative information or feedback, see [54]). Still other approaches, such as workshops or trainings, extract individuals away from their behavioral context, and tend to have a limited focus on certain layers.

Refs. [51–54], following this, a central prediction of installation theory is that to be effective and sustainable in transforming behavioral outcomes, design and intervention processes must be undertaken toward influencing as many aspects of the three layers as possible. Thus, it is not that one layer is more important than another, but rather that all three layers must be addressed together to effect sustainable behavioral changes. As a field experiment by Lahlou et al. [55] to promote water intake among children suggests, larger and longer-term effects can be achieved when redesigning aspects in the three layers, compared to redesigning aspects of only two of them. Similarly, an experiment by Yamin et al. [56] to reduce fuel consumption of professional truck drivers in Colombia showed how installation theory can be used to systematically identify the relevant physical, psychological and social determinants linked to a complex activity (such as driving heavy transport vehicles), to determine potential intervention options to redesign the current configuration, and to finally design a successful intervention to influence repeated behaviors over a long period of time.

1.1.3. Behavioral Change Techniques and Mechanisms

There is increasing recognition in the social and behavioral sciences that, far from being unique or representative of nuisance parameters, heterogeneity of intervention effects is to be expected by default given the diversity of intervention procedures, population characteristics and contextual factors [1]. This is unsurprising, given the vast number of distinct behavior change techniques at the interventionist's disposal. It is also important to distinguish behavior change techniques from mechanisms of action. A behavior change technique is a "replicable component of an intervention designed to alter or redirect causal processes that regulate behavior" while mechanisms of action refer to "theoretical constructs that represent the processes through which a BCT [Behavior Change Technique] affects behavior" [57]. Identifying effective components of interventions (so-called "active ingredients") as well as why and how they exert their effects can enable us to design more effective and sustainable interventions [58].

Efforts focused on linking hypothesized mechanisms of action to specific behavior change techniques can provide a basis for understanding causal processes in interventions [57]. However, there is substantial variation in how behavior change interventions are reported, and few studies provide evidence on the underlying mechanisms of action that drive behavior change [59]. Thus, in order for researchers and practitioners to be better equipped to develop and deploy cost-effective behavior change interventions, there is a need to systematically document the relationship between behavior change techniques and mechanisms of action. This facilitates the replication of intervention effects, the documentation and mitigation of unintended effects, and optimization of effective components of interventions.

Fortunately, there are several useful frameworks to guide the design and reporting of behavior change techniques. Michie et al. [50] identified 93 hierarchically clustered behavior change techniques in a wide review of the literature. These can be used to develop fit-for-purpose interventions based on theoretical or empirically identified mechanisms of action. Similarly, Connell et al. [57] identified 90 links between commonly used behavior change techniques and mechanisms of action.

Within the literature on changing social norms, which is central to the case studies chosen for this paper, Yamin et al. [34] identified four common dimensions of such interventions to guide designers—whether the intervention is delivered in the place where the behavior occurs vs. remotely, and whether the intervention comprises group summary information vs. exposure to the behaviors and opinions of others. Their framework also identifies and describes behavioral change techniques commonly used in social norm interventions in the literature to redesign physical, psychological and social layers of

determinants, remotely or in-situ (following installation theory). In addition, Legros & Cislaghi [60] determined five social norms change mechanisms discussed in the theoretical literature, which can also form the basis of social norms change interventions.

1.1.4. The Context: The Civic Culture Interventions of Antanas Mockus

Antanas Mockus is a Colombian academic turned politician. During his tenures as Mayor of Bogotá in 1995-97 and again in 2001-03, he applied several behavioral policy interventions that drew upon cultural and artistic motifs in order to effect change in social norms around entrenched societal problems and to promote a *cultura ciudadana* [civic culture] [7]. The result of this unconventional approach to behavioral public policy was an increase in compliance with the rule of law. For instance, between 1993 and 2004 (a 11-year period): homicides decreased by 70% [61] (p. 89), per capita water consumption was reduced by 46% [62] (p. 203), and over 63,000 families paid 10% of the taxes they owed voluntarily [63], to name a few.

Refs. [7,61–63], one of the first and most famous civic culture interventions to date is the mime-artist intervention, which is described in more detail in Yamin et al. [12]. In it, the Mayor's Office of Bogota sent a group of 20 mime-artists (at first) to the city center to influence the behavior of pedestrians and drivers when using pedestrian crossings. Eventually, 200 mimes were trained by that initial group and sent to different neighborhoods, while over 3000 allegedly corrupt traffic policemen were dismissed [8,64]. Mime-artists could not directly enforce traffic norms, but they became popular by mocking non-compliers and congratulating compliers.

Soon after, the Mayor's Office distributed "civic cards" that resemble the cards that are used by referees in football games to mime-artists and citizens. Civic cards had two sides: "a white or green one with a 'thumbs-up' to express approval and a red one with a 'thumbs-down' to express disapproval" [12] (p. 6). The cards were a tool to promote mutual regulation among citizens, and their use was demonstrated by mime-artists. And while the effects on behavior of this intervention was never experimentally evaluated, it is widely regarded as successful [7,12,65].

Several years after the application of the mime-artist intervention (between 2009 and 2011), Mockus' NGO applied another civic culture intervention that is also widely regarded as successful [6,9]. This time, it was in a 100,000-inhabitant city called Barrancabermeja in Colombia, and it was called the "Because Nothing Justifies Mistreatment" campaign (BNJM from now on). Through an alliance with the local authorities and the national oil company of Colombia, they applied a civic culture intervention to promote changes in the norms and behaviors of citizens. As described in more detail in Yamin & Geermann [10], the intervention included a new 24-h telephone line for people to talk to psychologists when they were feeling jealous, professional actors being sent to the streets to perform domestic violence scenes without the people knowing they were actors (invisible theater), well-known singers making popular songs about how domestic violence was unacceptable, visits by trained personnel to people's houses, and training programs for journalists on how to report cases avoiding sensationalism. Interestingly, it also included the distribution of 10,000 red whistles (like the ones used by the referee in sports) for people to use when they saw or were about to suffer domestic violence. In this way, the whistles worked as an auditive alert that was used by both witnesses and potential victims when aggression was about to happen or was just happening. Its goal was to stop violence from happening or escalating through the intervention of the collective. Like the civic cards above, this was also a mechanism to promote mutual regulation among citizens (calling attention and making public situations that either happened in private spaces, or where largely understood as private issues between couples, to promote a "vigilante effect", [2] (pp. 140–144).

2. Materials and Methods

In this article, we conducted an encompassing review of the two interventions described above to understand how they leveraged different determinants and affordances

to influence civic behavior and impact social sustainability. These determinants and affordances, which are the core of the installation theory [2,3] framework, were developed by also describing relevant elements from frameworks in the social norm and behavioral change literature: the domains in the "flower" framework from Cislaghi and Heise [66], the behavioral change techniques in Michie et al. [50], and the context of intervention in Yamin et al. [34].

By doing this, we aim to provide a clearer description of the characteristics and behavioral change mechanisms that were leveraged in these interventions to promote transformations in people's behavior. Even though the interventions were not explicitly designed according to installation theory and the other frameworks described above, we use them in an analytic and forensic perspective. An encompassing and detailed understanding of the underlying mechanisms that were leveraged in these complex and successful cases can shed light on how interventions can redesign physical, psychological and social determinants to impact social sustainability goals.

Information about the essential characteristics of the interventions, including their change model and the specific actions that were designed and implemented, was collected from a variety of sources that ranges from reports and research publications to news articles and interviews with their designers and participants. Given that these are policy interventions (rather than academic experiments) and that they were applied several years before this paper, the variety of information sources we collected was essential to make up for the lack of detailed and standardized reports and evaluations that are often produced in research experiments and evaluations. The data collection methods and materials used for each of the interventions include:

- Mime-artist intervention: Data collection around the mime-artist intervention was originally used for a previous publication by Yamin et al. [12], and it included the following data-collection activities applied between 2017 and 2019:
  - Press articles. The systematic collection of a total of 80 press articles from the main national newspaper in Colombia in terms of coverage and influence that describe the intervention. Online and printed articles spanning a 23-year period (1995–2018) were collected.
  - Citizen questionnaires. The application of questionnaires among 192 Bogota residents across city areas, age groups and socio-economic status. The questionnaires focused on the narratives that residents had around the perceived goals and characteristics of the interventions several years after it was applied.
  - Interviews with intervention designers. In-depth interviews to designers of the intervention.
  - Reports and publications. Research articles and chapters about the intervention and the civic culture approach, such as [7,63,65,67,68].
- BNJM intervention:
  - Interviews with intervention designers and implementers. Semi-structured in-depth interviews were conducted with the people in charge of designing, coordinating, and implementing the intervention around one year after the intervention ended. Five in-depth interviews were conducted in the summer of 2012 during fieldwork in Bogota and Barrancabermeja, Colombia.
  - Reports and publications. Intervention reports and academic publications about the design process and the results of the interventions were obtained from the relevant institutions. Press and research articles were also collected, including the one by intervention creators [9,10].

For the analysis, we used the information we collected above to build a "map" of the main determinants, modalities, and behavioral change techniques that were applied in each. Working from the most specific techniques in Michie's framework [50], we analyzed how the different layers of determinants [2] and the domains of intervention [66] were reconfigured as a result of the interventions. In addition to that, we also identified how the

policy challenges that the interventions were aimed to tackle (compliance with traffic norms and domestic violence), were conceptualized in the narratives around the interventions (thus justifying their need and their characteristics). This information allowed us to analyze how the two interventions reconfigured the three layers of determinants described in installation theory to promote behavioral change.

3. Results

3.1. Results: An Installation Theory View of Civic Culture Interventions

The analysis of the two interventions using the installation theory framework provide an encompassing view of otherwise complex policy interventions designed to tackle complex challenges in complex contexts. Reducing city-wide rates of road traffic accidents or incidents of domestic violence are challenges that directly affect all the concepts of the social sustainability framework, especially safety and sustainable urban forms. These challenges can be and have been addressed in several ways, from increased policing and penalties to awareness and "educational" campaigns. Nevertheless, such initiatives typically have a limited effectiveness on transforming the norms and behaviors of the populations they target, which usually translates to modest effects of only a few percentage points.

The civic culture approach is different. By addressing the physical, psychological and social determinants of action at the point of enactment in surprising and engaging ways, and by giving agency to participants to engage in mutual regulation, civic culture interventions have achieved spectacular results in city-wide indicators [6,12]. Nevertheless, because of how particular, complex and practice-based they are, systematically analyzing the mechanisms of behavioral influence they leveraged to achieve their results is difficult. Provided the right information is accessible or can be collected (as in this case), installation theory and the other frameworks presented overcome this by providing an encompassing, practicable guide to structure, report and analyze interventions that address the behavioral components of social sustainability challenges.

While the two interventions we analyzed target different policy challenges, they share several similarities. They are both strongly dependent on collective trends of citizens' behavior (more specifically compliance with the law), they are both difficult to control and enforce by standard means (as having police in every corner and every home is impracticable), and they both seem to be tied to local representations and social expectations. The challenges were addressed using a similar approach but adjusting to the particularities of each problem and context.

On the one hand, the mime-artist intervention tried to impact deaths in traffic accidents by increasing compliance with pedestrian crossings. The situation before the intervention combines limitations in the physical, psychological and social layers of determinants. Poor infrastructure and chaos (including in pedestrian crossings) are coupled with low enforcement by authorities, low knowledge on the right use, and low empirical and normative expectations (people seemed to believe nobody uses or expects one to use a zebra crossing). Instead of opting for more traditional policy interventions, such as building infrastructure, increasing police enforcement, and promoting awareness of the norms, the civic culture interventions went a different way. In part, this is due to the fact that these interventions seek to influence civic culture, so the beliefs, norms and capacity of citizens to regulate themselves is crucial (what Mockus calls the pedagogical balance that policy interventions should have). The result: mime-artists that regulate pedestrian crossings through live demonstration and soft mockery, and that distribute football-type civic cards for citizens to express their approval or disapproval of their peers' behavior. While no experimental evaluation was ever conducted in this and other civic culture interventions, the official city-wide rate of deaths in traffic accidents reported by the local authorities had declined by 65% at the end of Mockus' second term as Mayor [7,69].

On the other hand, the BNJM intervention tried to reduce cases of domestic violence, broadly defined as violence that happens inside the household. More specifically, the intervention focused on the type of cases that were most common: intimate partner violence.

Again, the situation before the intervention shows limitations in the physical, psychological and social spaces. Interventions that partially target one of those layers (for example, an awareness and education campaign) will seldom have long-lived effects if they fail to address the other layers as well. In this case, cases that happen mostly in private spaces (the household), are coupled with low enforcement by authorities, and strong beliefs on the typicality and social acceptability of "machos" using violence against their partner. A deeper examination of the motives of activity by intervention designers was translated into a focus on men's jealousy and "macho" culture [9]. To address those conditions (and notice how this is done partially but strategically), a complex intervention consisting of a telephone hotline to deal with jealousy, the distribution of whistles against abuse, house visits, training of journalists, surprise theatre scenes in public places, and a broader social marketing campaign was produced. Although, again, no experimental evaluation was conducted of this intervention, city-wide domestic violence rates reported by the local authorities had dropped by 40% after the two years of application of the intervention [9].

3.1.1. A Layered View of the Challenges

Under the installation theory framework, change interventions are a strategic redesign of the determinants that influence problematic or inefficient social and economic outcomes. Interventions that redesign the actual determinants of behavior that are in place at the point of enactment of the behavior, and that do so by addressing the three layers, have a higher chance of success [2,70]. Activities and determinants are usually investigated through the subjective evidence-based (SEBE) technique [71], which uses miniature cameras worn by subjects at eye-level and detailed replay-interviews to tease out what are the most important physical, psychological, and social elements that influence action in the target context. While the emphasis of this paper is on analyzing the interventions, and we can't apply the SEBE [71] technique retrospectively, a broad overview of some of the most important determinants that were targeted in each one of them is very useful to understand its rationale.

The following Figures 1 and 2 present a non-exhaustive overview of some of the main determinants referenced in reports and narratives of designers and citizens.
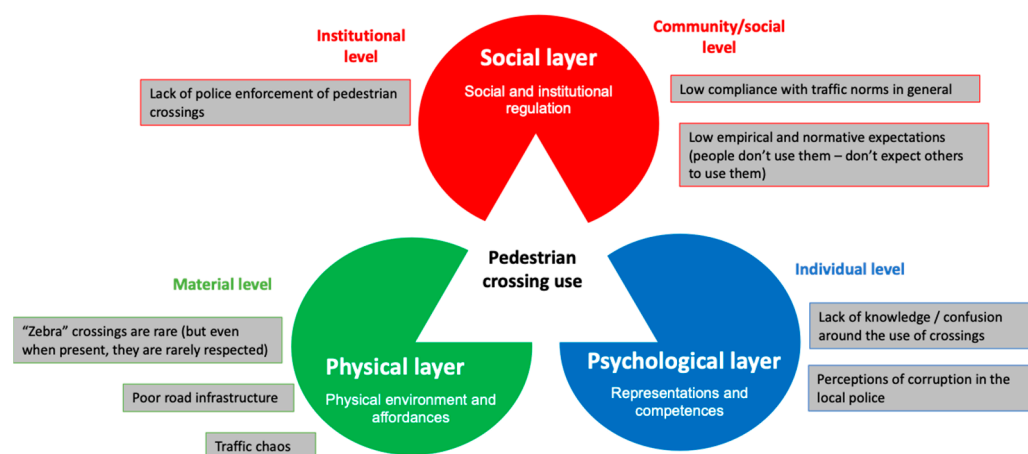

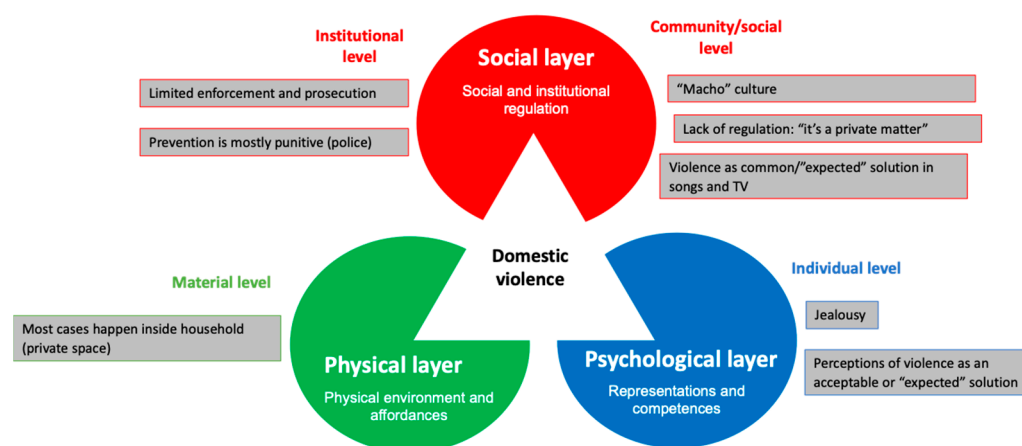**Figure 1.** Layers of the challenge: Mime-artist intervention.

Figure 2. Layers of the challenge: BNJM intervention.

3.1.2. A Layered View of the Interventions

The two tables below (Tables 1 and 2) present the main determinants (from Lahlou [2] and Cislaghi & Heise [66]), modalities (from Yamin et al. [34]), and behavioral change techniques (from Michie [50]) that we identified in the two interventions given the available information (Because we have limited information on the exact messages that were used in each of the intervention actions below, as well as on the narratives and inferences of participants, the factors below are not meant to be exhaustive. Factors are meant to illustrate how complex social sustainability challenges can be tackled with complex and multi-layered interventions that address physical, psychological and social determinants at the point of delivery of behavior).

Table 1. Domains and layers of determinants for the two interventions.

Delivery Method	Domains and Layers of Determinants (Lahlou [2]—Cislaghi & Heise [66])			
	Physical/ Material	**Psychological/ Individual**	**Social/ Institutional**	**Intersections**
1. Mime-artist intervention Policy goal: Increase compliance with traffic norms to reduce the city-wide rate of deaths in traffic accidents Target behavior: Increase compliance with pedestrian "zebra" crossings among pedestrians and drivers				
Mime-artists *(seen in person and through the media)* Civic card	Mime-artists Football cards	Reframing of representations around mime-artists and cards Reframing of representations on the role of citizens in civic life Demonstration of behaviors and ways to regulate others (linked to skills) Promotion of an embodied competence (skills) by facilitating practice of the vigilante role (specifically civic card) Mocking and congratulating participants (linked to emotions) Participants asked to participate during–after the intervention (linked to self- and group-efficacy)	Providing feedback and "feed-forward" on behaviors (mocking, congratulating, demonstrating) Promoting and supporting mutual regulation ("vigilante" role) Normative information: exposure to behaviors and opinions Unclear institutional or legal redesigns (but emphasis on law compliance)	Power: Intervention planned and applied by Mayor's office, while citizens are conceptualized as victims or villains. Gender: Unclear in intervention

Table 1. *Cont.*

Delivery Method	Domains and Layers of Determinants (Lahlou [2]—Cislaghi & Heise [66])			
	Physical/Material	**Psychological/Individual**	**Social/Institutional**	**Intersections**
2. "Because nothing justifies mistreatment" (BNJM) intervention *Policy goal: Reduce city-wide domestic violence rate* *Target behavior: Violence acts that happen inside the household*				
Whistle against abuse Invisible theater interventions Visits of trained personnel to houses A program of professionalization for journalists The creation of cultural products The creation of a 24-h telephone line Marketing campaign (inc. zero-hour event)	Football whistle Actors in public places Personnel visiting houses Telephone line Marketing materials and events	Reframing representations on whistles and gender roles Demonstration of behaviors and ways to regulate others (linked to skills and emotions) Promotion of an embodied competence (skills) by facilitating practice of the vigilante role (specifically whistle) Training of journalists (linked to skills) Participants asked to participate during–after the intervention (linked to self- and group-efficacy)	Providing feedback and "feed-forward" on behaviors (including even home visits by others) Promoting and supporting mutual regulation ("vigilante" role) Communicating that domestic violence is no longer acceptable, and that seeking help when jealous is (normative information) Normative information: exposure to behaviors and opinions Unclear institutional or legal redesigns (but emphasis on law compliance)	Power: Intervention planned and applied by public oil company, local authorities, and NGO, while citizens are conceptualized as victims or villains. Gender: Aim to reframe gender relations and roles (against "macho" culture and violence as typical and expected reaction to jealousy)

Table 2. Behavioral change techniques and modalities for the two interventions.

Delivery Method	Main Behavioral Change Techniques (Michie [50])—NonExhaustive	Modality (Yamin [34])
1. Mime-artist intervention *Policy goal: Increase compliance with traffic norms to reduce the city-wide rate of deaths in traffic accidents.* *Target behavior: Increase compliance with pedestrian "zebra" crossings among pedestrians and drivers*		
Mime-artists *(seen in person and through the media)*	2.2. Feedback on behavior 5.6. Information about emotional consequences 6.1. Demonstration of the behavior 6.2. Social comparison 7.1. Prompts/cues 8.1. Behavioral practice/rehearsal 10.4. Social reward 12.2. Restructuring the social environment	Situated (in the street) Remote (through media)
Civic card	2.2. Feedback on behavior (receive but also give) 3.1. Social support (unspecified) 8.1. Behavioral practice/rehearsal 12.2. Restructuring the social environment 12.5. Adding objects to the environment	

Table 2. *Cont.*

Delivery Method	Main Behavioral Change Techniques (Michie [50])—NonExhaustive	Modality (Yamin [34])
2. "Because nothing justifies mistreatment" (BNJM) intervention *Policy goal: Reduce city-wide domestic violence rate.* *Target behavior: Violence acts that happen inside the household*		
Whistle against abuse	2.2. Feedback on behavior (receive but also give) 7.1. Prompts/cues 12.5. Adding objects to the environment	Situated and remote (most actions, encompassing public and private spaces)
Invisible theater interventions	2.2. Feedback on behavior 3.1. Social support (unspecified) 5.6. Information about emotional consequences 6.3. Information about others' approval 7.7. Exposure 8.1. Behavioral practice/rehearsal 15.1. Verbal persuasion about capability	
Visits of trained personnel to houses	2.2. Feedback on behavior 4.1. Instruction on how to perform the behavior: 4.3. Re-attribution 6.3. Information about others' approval 8.2. Behavior substitution 13.2. Framing/reframing	
A program of professionalization for journalists	2.2. Feedback on behavior 4.1. Instruction on how to carry out the behavior. 8.1. Behavioral practice/rehearsal	
The creation of cultural products	5.2. Salience of consequences 6.3. Information about others' approval 9.1. Credible source 13.2. Framing/reframing	
The creation of a 24-h telephone line	11.2. Reduce negative emotions. 13.2. Framing/reframing	
Marketing campaign (inc. zero-hour event)	4.1. Instruction on how to carry out the behavior. 5.2. Salience of consequences 6.3. Information about others' approval 9.1. Credible source 13.2. Framing/reframing	

3.1.3. Behavioral and Change Models: The Civic Culture Approach

As described above, both interventions were designed following the civic culture approach [6,7,62,67]. In Refs. [6,7,36,62,67], the main emphasis is on transforming attitudes, perceptions, and behaviors that improve civic life (and so they often focus on peaceful coexistence and on increasing compliance with the law). In the civic culture framework, behavior is conceptualized as multi-motivated and multi-regulated, with interests, reasons and emotions as the most important motivators (after Elster [72]), and law, morals and culture as the most important regulators (after Mockus [63]). Civic culture's change efforts are conceptualized as a public pedagogy that has its main emphasis on transforming culture and social norms to impact behavior, as they are seen as the least complicated to intervene of the three regulators. To do this, interventions are designed taking familiar symbols and cultural practices (the mime-artists, the football cards), and giving them a new, surprising meaning or use [6].

3.1.4. Physical/Material Determinants

Both interventions include physical/material determinants that are crucial to how participants engage with them. These physical affordances are there not only to create

"awareness" or to provide reminders (cue/prompts) as many traditional communication campaigns do. Rather, they attempt a deeper restructuring of the social environment [50] by creating (surprising, engaging) performances or services that reframe social interactions. Mime-artists gently mocking or congratulating pedestrians and drivers do this, as well as invisible theatre actions and the telephone line in the BNJM case. This is not everything, however. The intervention also provides people with objects (cards and whistles) that remind them of the intervention, but more importantly, that allow them to provide and receive "feedback" to and from others in a relatively safe, playful way. Apart from reducing resistance to the intervention by playing on gentleness and humor rather than enforcement and authority, this also supports a sense of self- and group-efficacy [73,74], which are both essential to drive collective change and should ideally strengthen the capacity of groups and individuals to collectively adapt to changing conditions and new challenges.

In both cases, as we will discuss in more detail below, the intentionality here is a normative one: physical performances are meant to communicate that something is no longer acceptable in the group, while physical objects provide tools and encouragement for citizens to become vigilantes around it (cards, whistles).

3.1.5. Psychological/Individual Determinants

The psychological layer of installations includes the embodied systems that allow people to learn and interpret what's going on and how they are supposed to act. In our case, this layer seems to be mediated by three main factors:

- Representations. As reported by the creators of the mime-artist intervention [12], an essential characteristic of civic culture interventions is taking a familiar, well-known cultural practice, role or object (the mime-artists, cards, whistles), and giving them a new meaning and use. Mime-artists now regulate traffic and pedestrians, and football cards and whistles now censor bad behavior in the streets or at home. This supposes an anchoring of the materials used in the interventions (such as the cards and whistles) with well-known roles and representations (here, the notion of arbitration as with referees in football, that must be respected even if the parties are opponents). It also entails an important shift in both the representations of the materials that make the intervention (mimes, cards, whistles), and also on the broader representations around our role as members of society (from passive actors to "vigilantes", in this case). In previous research [12], we also identified how the understanding of the intervention's goal and the use proposed for objects as elements that seem to be crucial to explain people's engagement with interventions. The intervention, then, seems to try to reconfigure two levels of representations: specific ones linked to the intervention delivery methods, and general ones linked to civic life and the role of people in it.
- Skills. In addition to working on representations, both interventions also require some basic work on the skills people need to both react to problematic behaviors, and to use the objects (cards, whistles) that are provided to them. The above performances and further instructions seem to achieve this through demonstration (the mime artist continuously uses the card; invisible theatre actors continuously use the whistle).
- Emotions. Another powerful motivator in civic culture conceptualization are emotions. Fear of guilt or wanting to feel good about oneself, fear of shame, or wanting to be seen positively by others, are always included in civic culture interventions. According to Mockus, "Colombians fear ridicule more than punishments" [64]—an idea that also surfaces in narratives around the mime-artist intervention: "[. . .] here the mime-artist is mocking them [a truck driver] to make them feel bad so that they won't do it again".

3.1.6. Social/Institutional Determinants

In installation theory, the social layer is where "other stakeholders regulate our activity" [2] (p. 105) directly or indirectly. This includes both formal regulation systems such as laws or organizational rules, or informal ones such as social norms and cultural

values. Relevant to our work, social regulation is indeed another key aspect of civic culture interventions.

With regard to formal regulation systems, while both interventions come from powerful private and public institutions, they do not seem to engage in significant transformation of current legislation or law enforcement efforts. Rather, the emphasis is on achieving voluntary, conscious, and civic compliance with the law—which can certainly prove problematic in certain contexts and should be negotiated with care, but it is also an important driver of social sustainability.

The main emphasis of the interventions is on the informal regulation aspects. Designers aimed to change perceptions regarding what is considered acceptable in both cities (a central component of social norms), and to create a relatively safe and playful way to provide and receive feedback (through cards and whistles). The main techniques applied in both cases include communicating that the "wrong" behaviors are less acceptable (empirical expectations), demonstrating and allowing to practice the "right" behaviors and the "right" feedback, and then promoting and supporting continuous feedback on behavior. Mime-artists communicate that expectations from others regarding the use of pedestrian crossings are changing, and they demonstrate and allow people to practice how to correctly use crossings and how to use the cards to reprimand those that do not use them correctly. Cards and whistles promote and support continuous regulation when mime-artists, policemen, actors, or other institutional actors are no longer around. In this way, the typical and acceptable behaviors that are central to the concept of social norms (including the "right" behaviors and the "right" way to correct others), are not communicated through injunctions or instructions, but rather by exposing participants to the behavior and opinions of others.

As discussed above, this feedback loop and mutual regulation aspects are crucial: not only citizens receive feedback on their past behavior (or feed-forward on their future one) by mime-artists, but they are also given the physical, psychological and social tools to mutually regulate their peers, acting as "vigilantes" even to strangers. Of course, this also opens them to receive feedback from any of their peers. A gentler, distributed form of control represented in citizens and mime artists with cards and whistles is privileged over more traditional forms of authority-based control and enforcement by police or similar forces (which in these particular cases is especially problematic as there will never be enough human or capital resources to control every street and every household). And while the civic "vigilante" aspects are certainly risky and problematic (as most policy solutions), creating positive feedback and mutual regulation seems strategic to promote the peaceful coexistence and large-scale cooperation required for large-scale societies to work and sustain themselves in the long run.

3.1.7. Intersections: Power and Gender

Following Cislaghi and Heise's [66] framework, intersections in the individual, social, material and structural factors are often expressed as power and gender relations. Most norms and collective trends of behavior are supported by complex power relations (including gender ones), which every behavioral intervention disturbs or upends in some way. And although the information we have for our two interventions of interest is limited in this respect, two basic issues are clear in our analysis.

First, despite their desirable goals (reducing deaths in traffic accidents and domestic violence), it is important to keep in mind that interventions were designed and implemented by the local administration (in the mime-artist's case), and by an alliance between a public oil company, a specialized NGO, and the local administration in the other. This is not a limitation on its own, but it does shape how the intervention should be understood, analyzed, and also how it was perceived by citizens and other actors. Previous research [12] found that the mime-artist intervention is largely perceived as an effort from the Mayor and the Mayor's office, and that citizens are conceptualized as those who both suffer and create the problem. And even if a sense of self- and group-efficacy is indeed present (citizens are the ones that can change to solve the problem), the intervention is very much seen as a

top-down effort applied by the local authorities rather than by citizens. Despite this, an important point made by designers of the mime-artist intervention is that this is not meant to be an injunction or an order from the administration: rather than "providing answers" to citizens, civic culture interventions must "ask questions" [12]. In other words, interventions are applied to generate reflections within people rather than to tell them how to act, which seems to be an intriguing and potentially promising (but not uncontroversial) route for behavioral and social sustainability interventions to explore.

Second, more work is needed to analyze and engage critically with the power relations that are embedded in the target norms, behavioral trends, and contexts, and similarly about how they were transformed by the application of the intervention and by its effects. This includes power relations between intervention stakeholders (especially between the administration and other institutional actors with citizens), as well as the gender roles and relations that an intervention such as BNJM is aiming to transform.

3.1.8. Overview of Determinants

The diagrams below (Figures 3 and 4) present an overview of the main layers of determinants [2] and domains [66] identified for the interventions. These are not meant to be exhaustive, but rather to show how these complex behavioral policy interventions leveraged many layers of determinants to effect behavioral changes that ultimately informed social sustainability goals. While every context and every intervention are different, the intention is to demonstrate how installation theory and the related frameworks in discussion can guide the design and analysis of such efforts at the point of enactment of behavior.
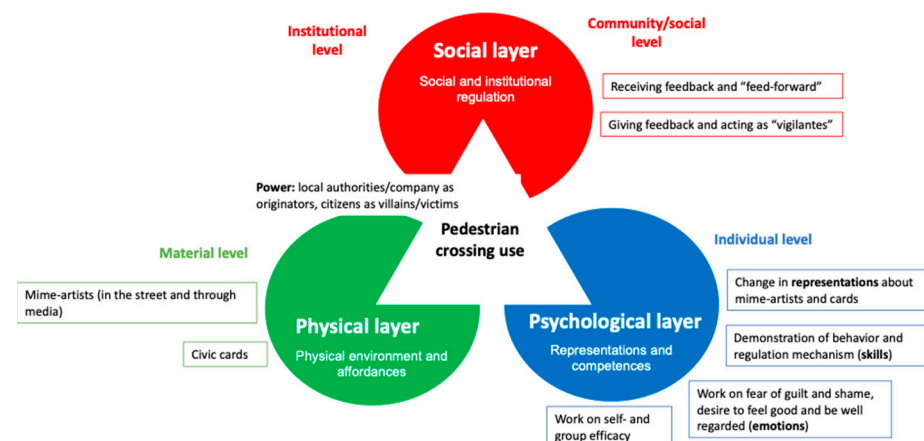

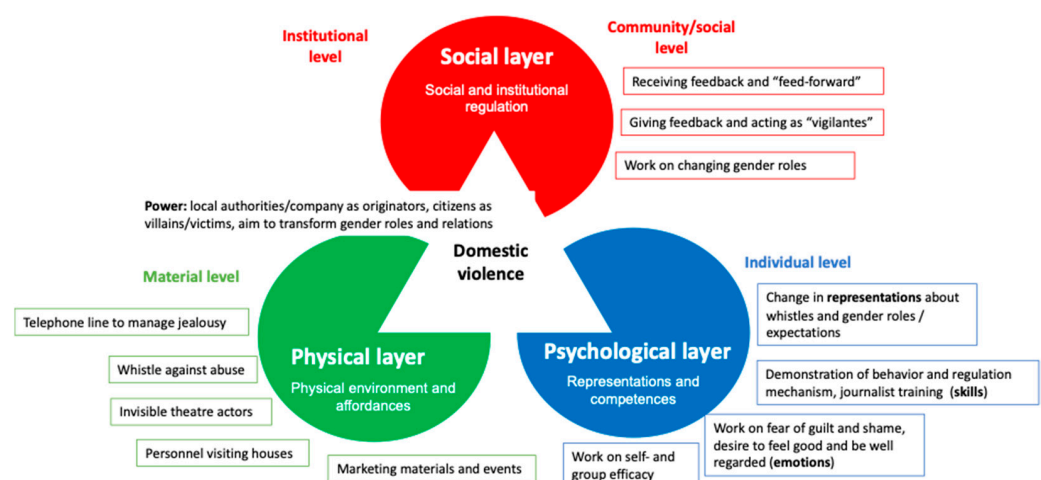**Figure 3.** Overview of determinants for the mime-artist intervention.

Figure 4. Overview of determinants for the BNJM intervention.

4. Discussion and Conclusions

Our analysis of the two interventions intended to promote civic culture in Colombia by Mayor Antanas Mockus illustrated several salient dimensions of sustainable and effective behavior change approaches. Identifying those dimensions was made possible by the practicable framework that installation theory provides, and which, as announced in the introduction, allow us to illustrate how physical, psychological and social determinants of action can be effectively leveraged at the point of enactment of behavior to produce large-scale transformations.

First, effective interventions leverage multiple behavioral influences, and are delivered where a behavior is typically enacted. While Installation theory provides a heuristic grouping of three layers (for example, physical, psychological and social), it is important to note that the layers are not mutually exclusive and can address multiple influences of behavior within each layer (redundancy is often key in sustainable installations). For instance, the intervention to reduce the incidence of domestic violence targeted several psychological influences of behavior such as emotions, self-efficacy, skills, and representations of gender roles and expectations. Thus, many psychological influences were targeted even within one layer of the intervention. In addition, individual behavior-change techniques, such as providing whistles to be blown when witnessing instances of abuse, can work together with other intervention components to address multiple layers. For instance, the provision of whistles to individuals targeted the physical layer by providing a physical priming device for intervention content, but it means also addressing the social and psychological layers by prompting individuals to rethink how they feel about speaking out on abuse, building skills related to using the whistle specifically for mutual regulation, and considering the social norms around doing so. Thus, effective behavior change interventions have multiple components that address different behavioral influences, and work together to reinforce intervention effects for different layers of influence.

Our study is not without certain limitations. For one, while we have collected several articles, interviews, and reports suggesting the effectiveness of the civic culture interventions, we cannot infer that such changes in welfare outcomes can be solely attributed to the interventions. To demonstrate such a relationship would require causal evidence, in the form of a randomized controlled trial, or even certain quasi-experimental designs, for which we simply do not have the required data. However, despite the lack of causal evidence, triangulating reports, interviews, and press articles suggested that the interventions are very likely to have resulted in the realized changes in desired behaviors. Secondly, our analysis of the interventions was limited to the available information in the public domain, and through our interviews. This means that greater information may have altered our results in reviewing the interventions. We do not view this as particularly concerning given that the information available has afforded an in-depth examination of such interventions, and their use of each of the three layers of installation theory. While our "forensic" approach might not exhaustively reveal all the ways in which these interventions leveraged local determinants of behavior, it does allow a coherent picture about the most important elements that structure this particular experience to be painted.

Despite this, the interventions we analyzed also highlight the importance of understanding the local context in order to develop culturally relevant and impactful approaches. While this idea may seem self-evident ("local problems require local solutions"), it is far from standard in the behavioral policy intervention toolkit. Rather, behavioral public policy has become nearly synonymous with the nudge [75] approach to behavior change, which focuses on altering individual choice sets to promote positive behaviors. While nudge-based approaches have been lauded for their cost-effectiveness and scalability, their effects are typically small [76] and generally delivered in a non-contextual modality at scale. However, such approaches falter for large-scale socially complex problems, such as traffic norms or domestic violence, and do not address multiple influences on behavior. This is perhaps why nudge-based approaches commonly fail for sustainable behavior change [74,75,77].

To tackle complex social challenges in a sustainable fashion, we advocate for targeting multiple influences of behavior across three related layers of behavioral influence gleaned from installation theory. By targeting these influences and specifying behavior change techniques that address them, behavioral interventions can be made more replicable, cost-effective, and ready for optimization. Identifying the theories and models that are used to conceptualize behavior and behavioral change in specific interventions is crucial, as it often shapes the assumptions and overall focus they take. Unfortunately, most behavioral interventions do not mention the theories or framework they use, hinting at the fact that many might not be using one [36]. They can also more reliably address deep-seated social and economic structures that influence behavior at the local level, such as through the dimensions of gender and power. In this way, context matters to address the local determinants of the targeted behavior, and must be in the foreground of the interventionist's approach.

Given the vast heterogeneity in the way that behavior change theories are conceptualized, used and implemented, there is an urgent need for a systematic and practical framework to guide applied practitioners in the design of effective and sustainable behavior change interventions. Installation theory offers several advantages for conceptualizing and creating sustainable behavior change approaches through a systematic consideration of the physical, psychological and social layers of behavioral influence. Interventions using behavior change techniques to address each of the three layers have the highest likelihood of sustainable change compared to interventions focused on one or two of these layers only. Relatedly, behaviors are embedded within complex overlapping ecological systems reflecting multiple levels of influence. These levels reinforce each other in myriad ways, and are often reflected in entrenched social and gender norms.

In the face of such complex social problems, addressing only one layer or level of behavioral influence would be tantamount to putting a band-aid on a serious wound. For instance, nudge-style behavioral approaches, while effective at scale and for certain behaviors, would likely not be useful on their own to address complex social issues such as gender-based violence in a sustainable manner. This is because such interventions typically cannot take contextual determinants of behavior into account for message content and intervention modality, and focus instead on simplicity and scalability. Such individual-focused approaches have their place within a larger and more systematic consideration of the multiple layers and levels of behavioral influence for specific problems, but they should not be taken as the go-to behavioral change strategy, as often happens today. By systematically delineating intervention components by technique, layers and ecological levels, practitioners can discard inert or counterproductive components in order to optimize interventions for efficiency and cost-effectiveness, in line with recent efforts at optimizing interventions and identifying their critical features [76,77]. Large-scale sustainable behavior change necessitates the consideration of the wider toolkit afforded by the social and behavioral sciences.

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