Enhancing Emotional Well-being in Urban Spaces: Unveiling the Potential of Tactical Urbanism through an Image-Based Randomized Control Trial

Abstract

Urban infrastructure development has traditionally been characterised by top-down decision-making processes, high costs, and lengthy timelines. Tactical Urbanism (TU) has emerged as a novel approach, offering a rapid, cost-effective, and participatory method for creating public spaces. While it is sometimes criticised as an 'empty urbanism' with little societal contribution that distracts city governments from long-term objectives, the experience of COVID focused people on the importance of access to public realm for emotional well-being. This study investigates the impact of TU on the emotional well-being of individuals compared to traditional infrastructure (TI) solutions. Focusing on two prevalent TU typologies—pocket parks and walkable streets—we conducted a randomised controlled trial involving 390 participants who rated 5,460 images depicting various interventions. Our results reveal that TU significantly enhances emotional well-being within public spaces, doubling the benefits of TI solutions, with a wide reach across diverse socio-demographics. The design elements of TU, integrating for example greenery in planters, murals, eye-catching urban furniture, lively colours, food trucks, floor treatment, and bicycle parking, are key contributors to these gains in emotional well-being. Our findings underscore the importance of incorporating TU principles into traditional urban planning practices to optimise the emotional well-being outcomes of urban infrastructure.

Key words: Subjective well-being, tactical urbanism, infrastructure development, traditional urban planning, public spaces.

1. Introduction

Over the last two decades, tactical urbanism (TU) has spread around the world as a new way of consolidating public space (Lydon & Garcia, 2011, Steffens 2013). Studies show the important role played by vibrant public space in urban life as it impacts social life, feelings of belonging and mental health (Anderson et al., 2017; Cattell et al., 2008; Giddings et al., 2011), while vacant land and dilapidated city spaces negatively correlate with these factors (Costa et al., 2021; Kim et al., 2020). At the same time, the quality of public space is positively associated with improvements in commercial activity, tourism, property value and recreational opportunities (CABE, 2004). For these reasons, public space regeneration has been a central strategy in the public sector's efforts to improve the well-being of citizens (Lak & Zarezadeh, 2020).

Tactical Urbanism is often contrasted to fixed, rigid, lengthy, and officially sanctioned traditional planning and public investment processes. TU has emerged as a fast, flexible, and less costly strategy for consolidating public space (Németh and Langhorst, 2014; Yassin, 2019), well adapted to respond to the pace of a rapidly urbanising world, especially in developing countries. For Németh and Langhorst (2014) temporary planning solutions, such as TU, offer incremental, flexible, and experimental responses to planning much more adapted to the rapidly changing economic and social city processes, agendas, interests. However, many do not share this view, seeing in this strategy a precarious form of urban planning that degrades quickly and diverts attention from more fundamental long-term urban investments (Fuentes, 2018). Again, this sets up TU and traditional planning as a binary, an approach that Vallance & Edwards (2021) seek to challenge. As they note, both are likely to share common aims such as producing more sustainable urban environments, but seek to do so through different mechanisms over different timescales. TU may be viewed as providing quick wins that might help deliver long-term change. A pocket park carved out of space previously used by cars might provide an opportunity for people to experience the benefits of a long term plan to reduce car use in urban areas.

While much evaluation of urban planning favours the objective benefits of a given infrastructure – for instance through cost-benefit analysis – public space planning provides the unique opportunity to enhance also the subjective well-being (SWB) of citizens (Benita & Bansal, 2019). SWB relates to people's evaluation of how well their lives are going, using

thoughts (cognitive evaluation) and, central to the purpose of this research, evaluation of emotions as they occur (emotional evaluation) (Diener et al., 2002). There is evidence of a strong relationship between people's emotional SWB and the built environment, with a low-quality built environment eliciting emotions such as distress, anxiety (Mendez et al., 2020), insecurity (Valentine, 1990; Navarrete-Hernandez & Afarin, 2023, Navarrete-Hernandez et al., 2021; 2023), and reducing happiness (Benita & Bansal, 2019; Dane et al., 2019; Navarrete-Hernandez & Laffan, 2019; 2023). Research further shows that human behaviour is conditioned by emotions (Lerner et al., 2015; Russell et al. 2017; Wang et al. 2018), including pro-environmental behaviour (Lam et al. 2022) such as waste recycling (Ma et al., 2018), air-conditioning use and energy saving (Gao et al., 2017). For this reason, urban planners and policymakers have increasingly focused on creating public spaces that stimulate citizens' positive emotions and reduce their negative emotions (McGill, 2015).

Since TU generates a change in public space – for instance, through the transformation of a grey street for vehicles into a brightly coloured pedestrian street – it should also have an impact on people's emotional SWB. Despite this logical connection, to the best of our knowledge there is no empirical evidence considering the impact of these emerging TU interventions on the emotional SWB of people using a given public space.

This paper answers four main research questions around the impact of TU on emotional well-being: How do the impacts of TU and traditional solutions on emotional well-being in public spaces compare to one another? What is the relevance of socio-demographic characteristics in regulating the impact of TU on emotional well-being? Do different types of TU strategies have similar impacts on emotional well-being? and, What are the specific elements incorporated by TU into public space that trigger emotional well-being enhancements? To address these questions, participants in a randomised controlled trial (RCT) assessed their emotions of happiness (as a proxy for positive emotions) and sadness (as a proxy for negative emotions) when viewing images of street scenes with no changes (used as a baseline), with traditional infrastructure solutions, and with various types of TU interventions.

In the next section, we provide an overview of the relevant literature regarding the relationship between emotional SWB and the built environment, along with the criticisms of TU strategies as effective public space interventions. We then discuss the image-based RCT methods used in this study. Following this, we present the findings of the study, and finally end with a discussion of the main conclusions, limitations, and policy implications of the study.

2. Literature Review

2.1. Tactical Urbanism

Tactical Urbanism has garnered attention as an alternative approach to urban planning and design, one that presents a dynamic and participatory strategy for shaping cities (Alisdairi, 2014). One notable aspect of TU is its emphasis on the temporary and reversible quality of interventions (Dovey, 2016; Stevens & Dovey, 2022), as exemplified by pop-up parks (Stevens & Dovey, 2018), outdoor seating areas (Elrahman, 2016) and temporary bicycle lanes (Kurniawati, 2021), each used to improve spaces in a short period of time and incorporating a built-in flexibility (Silva, 2016). Another central characteristic is the emphasis on the small-scale (Stickells, 2011), facilitating the aim of providing low-cost solutions (Brenner, 2015; Lydon & Garcia, 2011) by utilising readily available materials (Sivakkumar et al., 2020) and existing infrastructure (Messeidy, 2019). The most common elements incorporated into these transformations are food trucks, bicycle parking, painted surfaces, street furniture and planters containing trees and vegetation (Berglund, 2019; Silva, 2016; Fuentes, 2018; Martínez, 2020; Papastergiou, 2021).

Seeking to classify the variety of individual interventions described, Lydon and Garcia (2011) identify at least three clear typologies of TU: open streets; pocket plazas; and parklets. The open streets typology consists of interventions that see a temporary redefinition of street usage, shifting from being used by cars to being dedicated to cyclists and pedestrians, promoting social interaction and physical activity. Pocket plazas (or ‘pavement to square’ schemes) see asphalt surfaces or brownfield land revived with urban furniture, greenery, street art and often food trucks, providing urban spaces for leisure and socialising (Fuentes, 2018; Martínez, 2020; Papastergiou, 2021). A parklet is a semi-segregated area adjacent to pedestrian pavement that draws focus away from cars, and can include the introduction of flexible street furniture, planters and tables for eating near gastronomic establishments. However, since the early classification by Lydon and Garcia (2011), new intervention typologies and elements have emerged, spurred by the COVID-19 pandemic. During this period, local governments and international organizations identified opportunities to adapt public spaces, particularly in active mobility and outdoor use of public space. This included implementing strategic systems of bike lanes and improving safety at road intersections (Alarcon et al., 2022).

The integration of TU spaces provides a context in which community engagement can easily and naturally be facilitated. TU has been referred to as "do-it-yourself" urbanism, enabling the appropriation of spaces by the local community (Deslandes, 2013, p. 217). This may include community-driven searches for underutilised or abandoned spaces suitable for revitalisation (Hussein & Abrahem, 2019) such as abandoned buildings (McGuire, 2018), underused parking areas (Davidson, 2013) or vacant lots (Munro, 2017). In doing so, problematic spaces can be detected and transformed into sites of community attraction and appropriation (Fabris et al., 2020). Elrahman (2016, p. 226) sees TU as enabling the decommodification of urban space by transforming private spaces into places open to everyone, thus emphasising urban spaces' use values over their exchange values. Canelas and Baptista (2020) view COVID-19 related lockdowns and restrictions as having offered opportunities for communities to employ TU to reassert their aspirations for public space, as the pandemic froze much commercial activity. In a concrete example, Mould (2014) considers parklets developed by local activists in San Francisco, arguing that they have successfully transformed paid car parks into spaces for people to use free of charge, simply by laying grass, planting greenery and installing benches. That being said, in recent years more institutionalised strategies have emerged, with local and regional governments directly delivering TU projects and planning strategies (Lydon & Garcia, 2015; Ortar & Rerat, 2024). This was particularly pronounced during and after the COVID-19 lockdown period, as the need to rapidly adapt the city to new requirements for social distancing, active mobility and new use of public spaces put pressure on governments to quickly transform the built environments. For instance, in Paris, Barcelona, Milan, and New York, city governments rapidly expanded cycle lanes by painting streets, and repurposed parking spaces into terraces and vending spaces to support commercial activity (Fabris et al., 2023; Pradifta, 2021; Ortar & Rerat, 2024).

Lak and Zarezadeh (2020) go further to argue that the improved urban landscape generated by TU can reinforce a city's neighbourhood identities. The authors highlight that, for example, through the development of murals and the application of colourful paint, the aesthetic qualities of the local space are made recognisable and elevated, creating a sense of place. This can be seen, for example, with the creation of the Paseo Bandera in Santiago, Chile, which consists of a large, colourful area of public space that stands out amidst the grey of the historical city centre (Jirón, 2021). Furthermore, Elrahman (2016) points out that TU allows public spaces to be redefined and regenerated over time, incorporating new programs dedicated to the needs of communities as they evolve. Indeed, TU is often fundamentally characterised by its reliance on

citizen participation and experimentation with new public space uses, placing at centre stage community engagement to shape and gain a sense of ownership over urban environments (Balicka et al., 2021; Courage, 2013; Elbeah et al., 2022; Stevens et al., 2021).

Notwithstanding its community-led focus and temporary character, TU is also an approach that can provide a tool to local government, to prototype interventions that can also be turned into more permanent interventions. Again, this challenges the binary of TU and traditional planning. Urban governance is inevitably complex, as cities bring into close proximity multiple demands on and expectations for space (Storper 2014). Given this, TU is a potentially useful asset to aid city administrations in their perennial attempt to balance the competing demands on urban land use. Through TU, administrations can test ideas, gather feedback, and make adjustments before committing to improvement through expensive large-scale urban interventions, allowing them to be more innovative and flexible when delivering transformative urban responses (Campo, 2016).

The potential benefits of TU to community and city administrations are countered by several criticisms. First is a higher-order criticism that TU represents the rolling-out of a neoliberal model of urban planning where communities must bear the burden of responsibility as the state is rolled back, and where the more innovative and flexible state is linked to entrepreneurial governance focused on facilitating capital taking over public space. For Jirón (2021) and Mould (2014), urban spaces converted through TU have a strong mercantile component, in that they commonly incorporate stalls selling goods and offering services, as well as advertising spaces, reinforcing the entry of rental capital into new territories to exploit public spaces. This, according to the authors, would be nothing more than a continuation of the current model of neoliberal urbanisation, camouflaged with a novel discourse of enhancing people's well-being through public space improvements. Both Le Galés (2016) and Storper (2016) however argue against this discourse in which any market intervention or commercialisation of public space is assumed to be negative and labelled as neoliberalism. Both seek to distinguish between market economics and state management, which can have a positive role in efficiently allocating resources, and the ideological project of neoliberalism. From this perspective, TU widens both the range of community and market actors in urban space, and encourages experimentation in urban governance, but it is not inevitably supportive of neoliberalism.

A second, more pragmatic criticism, is that the conversion of public space does not always trigger positive effects of revitalisation, and on the contrary might see the removal of useful

traditional urban infrastructure, leading to the deterioration of existing urban spaces and their surroundings. Yassin (2019) illustrates this through a study of the transformation of a series of traditional shopping streets into pedestrian centres through urban tactics in the USA. This process has led to lower sales in local commerce and a deterioration of neighbourhood safety, such that after twenty years of degradation, in cities such as Pomona and Burbank these public spaces were restored to their original function as streets for vehicular traffic. TU has also been criticised for its "empty creativity and lack of identity". For Mould (2014), the claims for TU's benefits as agile and efficient are tempered by it being, essentially, a precarious form of urbanism marred by its temporary nature, low-quality solutions and lack of economic substance.

Third, TU is criticised for its role as an oversimplified response to the need for immediate results that garners press attention, visibility and electoral support — one that distracts public policy from long-term structural solutions, such as the development of regulatory plans and investments in higher-cost public space and infrastructure (Mould, 2014; Fuentes, 2018), leading to the critical label of "patchwork" urbanism. TU threatens, then, to replace traditional long-term urban planning and investment strategies with public space transformed through inexpensive materials, rendering it vulnerable to rapid deterioration. From this perspective, since TU distracts from long-term objectives, traditional urbanism approaches are preferable for urban investment. Once again, it is important to avoid binary depictions that force a choice between traditional urbanism (including strategic spatial planning) and TU. The danger of "patchwork urbanism" is better regarded as practical rather than a principled critique that ultimately recognises that practitioners must remain mindful of how TU is delivered and what it comprises.

Clearly, TU offers a novel means of delivering urban interventions, but this alone is insufficient reason to adopt it, and it is important to understand the full breadth of its effects and outcomes. Several other recent studies have proposed techniques for assessing TU initiatives, both before and after interventions. These include Smeds and Papa (2023), who assess citizens' perspectives of 'street experiments' across several dimensions, including their social and economic impacts. Moving away from participant-based evaluation, Kinigadner et al. (2024) set up an assessment framework for analysis that employs systematic data collection across a range of fields, and seeks to link the aims of the scheme, the nature of the intervention and its impacts. Finally, in an approach closer to ours, O'Connor (2020) employs a variant of the Latin Square method, using expert subjects to assess the potential for colour interventions to enhance

pedestrian safety. As Cariello et al (2021) note, the COVID-19 pandemic has refocused attention on the contribution of outdoor space to emotional as well as physical well-being, alongside providing circumstances that have allowed for an expansion of TU as a method. Our contribution relates to both intervention methods and personal response, as we apply a randomised control trial to test for the potential of TU to contribute to emotional well-being

2.2 Subjective Well-Being and the Urban Environment

Well-being has been defined as a multidimensional concept associated with how well individuals fare in material, social, health and subjective dimensions (Dolan & Metcalfe, 2012). Within the concept of well-being, two subsets can be distinguished: objective and subjective well-being. Objective well-being refers to the external and tangible conditions that people possess, such as their physical state or the quality of their surrounding environment (Reyes-Riveros et al., 2021; Huppert & So, 2013). In contrast, subjective well-being (SWB) constitutes people's mental judgements of their life satisfaction, domain satisfactions and emotional responses (Diener et al., 1999). 'Mental-state' approaches propose that SWB should be included as a fundamental part of well-being assessment evaluations (Helliwell & Barrington-Leigh, 2010). Dolan and Metcalfe (2012) go further to argue that researchers and policymakers should consider SWB as the true account of well-being, as it is ultimately people themselves who are best placed to evaluate their own experiences of well-being, rather than proxy objective well-being measures of wants (preference satisfaction) or needs (objective list).

Diener et al. (2002, p. 63) further divided SWB by distinguishing a cognitive and emotional (affective) component. The former refers to an individual's cognitive evaluation and judgement of their life, such as their overall life satisfaction, perceived purpose and meaning and self-esteem (Lyubomirsky et al., 2005; Diener et al., 1999). The latter (emotional SWB) refers to individuals' emotional experiences and affective states, including positive emotions like joy and happiness, and negative emotions like sadness and anger (Mendez et al., 2020).

There is a growing body of evidence showing that emotional SWB is linked to urban infrastructure, with changes to the built environment and activities held in public space triggering various positive and negative emotions (Moore et al., 2018). Studies have shown that empty or deteriorated spaces provoke emotions of fear and insecurity, demonstrating, for example, that women are more likely than men to feel unsafe in abandoned or isolated spaces, and to avoid walking in dark public spaces (Crime Concern, 2004; Yavuz et al., 2010; Gargiulo et al., 2020), and that the presence of blind walls increases fear and concern for safety (Adu

Mireku, 2002; Navarrete-Hernandez et al. 2021). Conversely, several studies have demonstrated that proximity to larger green spaces can positively impact emotional SWB by providing opportunities for relaxation, physical activity and social interaction. Places with well-maintained parks, for example, have been shown to generate positive emotions such as happiness and a sense of security (Dane et al., 2019; Navarrete-Hernandez & Afarin, 2023), and several authors have demonstrated that green infrastructure positively influences self-perception of both positive emotions and mental health (Triguero et al., 2015; Carter & Horwitz, 2014; Dunstan et al., 2013; Navarrete-Hernandez & Laffan, 2019; 2023). Navarrete-Hernandez and Laffan (2019 & 2023) show that higher levels of street-level green infrastructure produces a positive impact on happiness.

2.3 Tactical Urbanism and Potential Impact on Subjective Well-Being

TU thus seems likely to have an impact on people's emotional SWB, as it sees the incorporation of a new and unique set of elements that change the built environment and generate new activities in public space. Several theories from environmental psychology suggest that a number of these elements might positively impact emotional well-being. The Biophilia Hypothesis (Wilson, 1984) proposes that humans evolved to have an innate affinity with nature, and that resourceful environments foster the elicitation of positive emotions. Recent empirical evidence further shows that even the presence of small dosages of greenery – for example, in urban planters – can lead to significant increases and decreases in positive and negative emotions respectively (Navarrete-Hernandez & Laffan, 2023). Furthermore, Color-in-Context theory (see Elliot & Maier, 2012) proposes that colours have meanings to people, which trigger functional appraisals of an environment as hospitable or hostile (Elliot & Covington, 2001, Friedman & Förster, 2010), leading to concomitant positive and negative emotions, and triggering behavioural reactions (approaching/avoiding). Bright and vivid colours used in the murals, ground surfaces and furniture of TU could in some contexts trigger perceptions of hospitable spaces and thus increase (decrease) positive (negative) emotions (Vanderveen & van Eijk, 2016).

Environmental Preference Theory (Kaplan, 1987) proposes that humans have evolved to value the qualities of environments in which the specie thrived, and these qualities similarly trigger positive affects and reduce negative affects. Kaplan selected four key components of an environment: coherence (environments that are ordered and coherently organised); legibility (environments that are easy to read and navigate); complexity (richness and variety in an

environment); and mystery (intriguing and attractive environments, suggesting that more remains to be discovered). TU spaces are often complex in their pallets of elements, colours and activities that span across space, and incorporate multiple details awaiting 'discovery' as a subject navigates them. For instance, a mural captures attention, and through complex design invites subjects to explore its content. Finally, Affordance Theory (Gibbons, 1979) proposes that the actual or perceived properties of an object or environment give clues to subjects about how it should be used. In this sense, many elements of TU suggest actions that trigger positive emotions and pleasure. For instance, planters suggest activities of relaxation; furniture, sitting areas and food trucks provide opportunities for relaxation and social interaction; painted ground and murals indicate activities of observation and contemplation; and the integration of bicycle parking suggests that active modes of transportation are welcome, facilitating social interaction. These supports the idea that, when observing TU spaces, positive emotions may be triggered by the presence of affordances linked to pleasurable activities. Indeed, changes in people's emotional well-being, defined through measures such as happiness, have been associated with the performance of activities and presence of people in the kinds of open spaces created via TU (Benita & Bansal, 2019). Furthermore, the indirect or 'on-the-go' observation of the activities of other people – for example, when passing by cafes, restaurants and stores – tends to improve emotional SWB (Dane, 2018; Birenboim, 2018; Ettema & Smajic, 2015), as these 'indirect activities' are read as opportunities for socialising, meeting, interacting or enjoying spontaneous encounters with others.

These characterisations contrast with criticisms of TU that portray it as empty or precarious urbanism, and allow us to recognise the potential for TU to benefit the local communities that inhabit urban spaces and their surroundings. It is this potential that informs our aim here of exploring the ways and extent to which TU can impact emotional well-being.

3. Methodologies

3.1 Study Design

To better understand the extent of the relationship between emotional SWB and TU, an image-based randomised control trial was designed in which participants rated their level of perceived happiness and sadness when viewing computerised photo-simulations of TU interventions. This offers the advantage of measuring perceptions across a variety of urban contexts, and simulating various TU interventions using real representations of public spaces in the city, without

compromising the causal nature of the study.[1] Several studies in environmental psychology have demonstrated the ability of images to evoke emotions, and urban studies have used images and photo-simulations as a way to elicit emotions in and preferences of public spaces (Costa et al. 2021; Hoffman et al. 2023; Huang et al. 2020; Jiang et al., 2017; Kim et al., 2012; Kuo et al., 1998; Nejati et al., 2016).

Data collection was conducted between August and September 2020. In the experiment, respondents were asked to rate control or treatment images according to their perceptions of happiness and sadness using an adaptation of the PANAS-X questionnaire (Watson et al., 1988). As our study is focused on emotional SWB, we use happiness and sadness as proxies for measuring positive and negative emotions respectively, opting to use standardised psychometric scales to quantify participants' self-reporting, as they are able to account for personal experience while also allowing comparison between individuals (Reyes-Riveros et al., 2021, p. 2). In this version, both happiness and sadness are measured on 10-point scales, with (1) indicating very slightly or not at all, and (10) indicating extremely.

Fourteen sets of images were used, with each set containing unmodified (control) images and a number of modified (treatment) images incorporating either traditional infrastructure solutions or TU interventions. All images were taken in Barrio Yungay in Santiago, Chile, which currently contains no TU interventions. When selecting elements to represent traditional infrastructure, we focus on the most common interventions currently present in Santiago de Chile[2]. We use squares that are typically characterised by grass and gravel surfaces, benches and trees, while we selected pedestrian streets mainly composed of concrete tiles and also incorporating trees and benches. These selections largely reflect the standard practices of local municipalities in urban infrastructure projects, where budget constraints and limited design resources often dictate the use of these basic yet functional designs. The images constructed and presented to participants follow these principles to accurately represent the most likely alternative that municipalities would deliver in the absence of TU in Santiago.

[1] Our causal claims are limited to the effects of exposure to static visual stimuli and not to multisensory settings, where different outcomes may or may not occur.

[2] The authors acknowledge that traditional infrastructure solutions can vary widely across the globe, and that cities such as Paris, New York and London are continually redefining public space, actively incorporating some elements of TU. However, for our study, we selected traditional infrastructure solutions commonly used in Chile (and more widely across South and Central America) to provide a familiar landscape for participants in the study. These approaches are also commonly found in public spaces in cities worldwide, particularly in neighbourhoods lying beyond the city centre and touristic areas.

When creating TU images, the use of interventions already implemented in Chile was avoided in order to minimise the possibility of participants recognising the intervention in question, which could bias their responses. The 14 treatment images were divided into two categories representing two typologies of TU interventions in the urban space: pocket plazas (8 images) and open streets (6 images). The first group contains images of a traditional square replaced by a pocket plaza with greenery, street furniture, food trucks, bicycle parking, colourful murals and floor treatment. The second group corresponds to a street that has been converted into a pedestrian promenade following the 'open street' intervention approach, incorporating greenery, street furniture, sculptures, paintings and bicycle parking.

Along with the two treatment images mentioned (traditional infrastructure and TU intervention), an additional third treatment image was generated for each TU intervention in which an element had been removed, so as to detect each of these elements' influence on participants' ratings. An example of this would be to remove the street furniture from a TU image while keeping all the remaining elements in place. This strategy allows us to distinguish which element(s) of the TU intervention is (are) triggering the effects on emotional SWB. Figures 1 present the 56 images used in this experiment.

Fig. 1 Photo-simulations of pocket plaza and open streets interventions used for the experiment.


Control
Treatment A
Treatment B
Treatment C
Categories
Brown Field
(No Infrastructure)
Square Renovation
(Traditional Infrastructure)
Pocket Square
(Tactical Urbanism)
Pocket Square without one element
(Tactical Urbanism - 1)
1. People
2. Vegetation
3. Furniture
4. Food Trucks
5. Murals
6. Floor Treatment
7. Live Colour


Control
Treatment A
Treatment B
Treatment C
Categories
Vehicular Street
(No Infrastructure)
Pedestrian Street
(Traditional Infrastructure)
Open Street
(Tactical Urbanism)
Open Street without one element
(Tactical Urbanism - 1)
1. People
2. Vegetation
3. Furniture
4. Sculptures
5. Floor Painting
6. Bike Parking

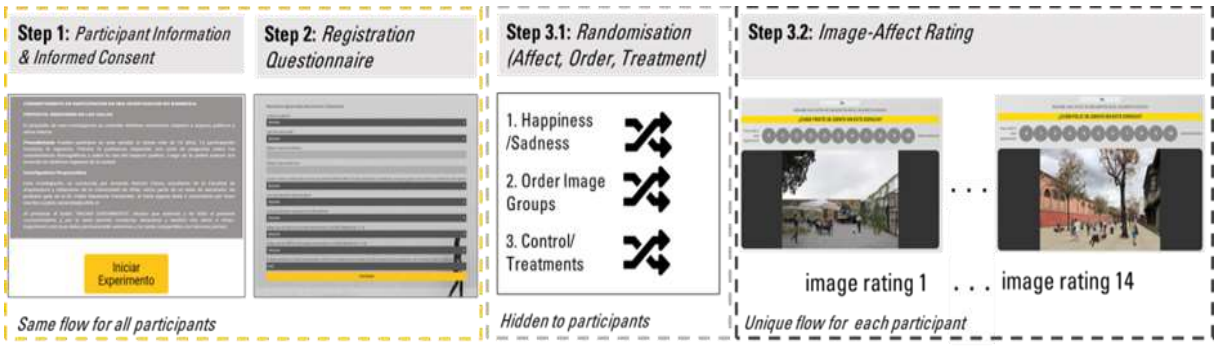
362

363 3.2. Sampling Strategies

364 As data collection was conducted during the COVID-19 pandemic, online-only data collection
365 was performed. The image-based experiment platform www.urban-experiment.com was used
366 to deliver the methods. The experiment was distributed through social networks and participants
367 responded via their own smart devices. In total, 390 people completed the experiment,
368 providing 5,460 image evaluations.

369 The survey was divided into two parts. The first included a questionnaire collecting the
370 sociodemographic characteristics of the participants (age, gender, nationality, educational level,
371 place and neighbourhood of residence) as well as their levels of happiness and sadness
372 experienced over the last week. In the second section, respondents were asked to imagine
373 themselves walking in the location shown in each image and to state their perception of
374 happiness or sadness. Participants rated a series of 14 images on a 1-10 scale according to the
375 happiness or sadness perceived in the urban space featuring the intervention, with a rating of
376 (1) meaning "slightly or not at all" and (10) meaning "extremely". Figure 2 provides a flowchart
377 of the experiment.

378 **Fig 2** Experiment Flowchart



379

380 To strengthen the validity of our findings, we took several steps to control for potential
381 confounding variables. To ensure that the participants' observable and unobservable covariates
382 were balanced between the control and treatment groups, a double randomisation process was
383 used when assigning images to each participant. First, the order of each category of images
384 presented was randomised. This allows for the control of any possible spillover or fatigue
385 effects that may affect participants when responding to multiple images simultaneously.
386 Second, as is done in any RCT, for each group of images a random assignment determined
387 whether the participant would see a control image or one of the treatment images (control: no

intervention; treatment 1: traditional infrastructure; treatment 2: tactical urbanism; treatment 3: tactical urbanism with one element removed). This allowed for a probability-balanced allocation of covariates between the control and treatment groups. We test this hypothesis by running robustness checks (see Section 3.3.2) showing that our estimates remain robust and significant to the addition of 6 relevant controls when compared to the regression without controls (Eq. 1). Moreover, to obtain comparable sets of images, we kept all baseline environmental factors constant (e.g. cars, buildings, people, weather) across control and treatment images, ensuring that these variables did not influence the results. Together, these strategies control for participant and image characteristics, allowing the confident assertion that the observed effects are due to the photo-simulated treatment, thereby validating the internal consistency of our causal inferences.

3.3.1 Empirical Strategy

Random intercept models with image-level fixed effects were used throughout the experiment. Random intercept was included to account for the assumption that each participant might have a unique predisposition to feel happy or sad. Image-level fixed effects were included to control the happiness and sadness ratings of each image. The following regression was performed on the results:

$$(1)\ \text{Perception}_{ij} = \beta_1 + \beta_2 \text{Treatment i} + \beta_3 \text{Image}_i + U_j + E_{ij}$$

The dependent variable *Perception* ij gives the perceived happiness or sadness rating for image i of individual j on a scale of 1 to 10; β_1 represents the constant (in our case, the baseline images without intervention); *Treatment* i, the independent variable of interest, is a categorical variable representing the control or one of the treatment images. The coefficient β_2 indicates the average treatment effect (ATE) on people's perception of happiness or sadness on image i; *Uj* is the random intercept associated with the j-th participant; *Eij* is the error term. This regression is performed independently for all categories of interest.

3.3.2 Robustness check

We examine the robustness of results by running Eq. (1) without and with control variables (Eq. (2)), which includes the six sociodemographic characteristics of the participants (see Subsection 3.2), plus two study conditions: image order, and date of the test. The model takes the following form:

418 (2) $\text{Perception}_{ij} = \beta_1 + \beta_2 \text{Treatment}_i + \beta_3 \text{Image}_i + \beta 3 X_{ij} + U_j + E_{ij}$

419 The model is same as Eq. (1), except for Xij, which contains the demographic variables for
420 participant j, and the measure of study conditions for image i. The study reports only results
421 with a significance at 5% in both models as a way to minimise false positive errors (type 1
422 errors). All figures below display results without controls, while the model with controls can
423 be found in the tables in Appendix 1."

424 # 4. Results

425 ## 4.1 Overall Results

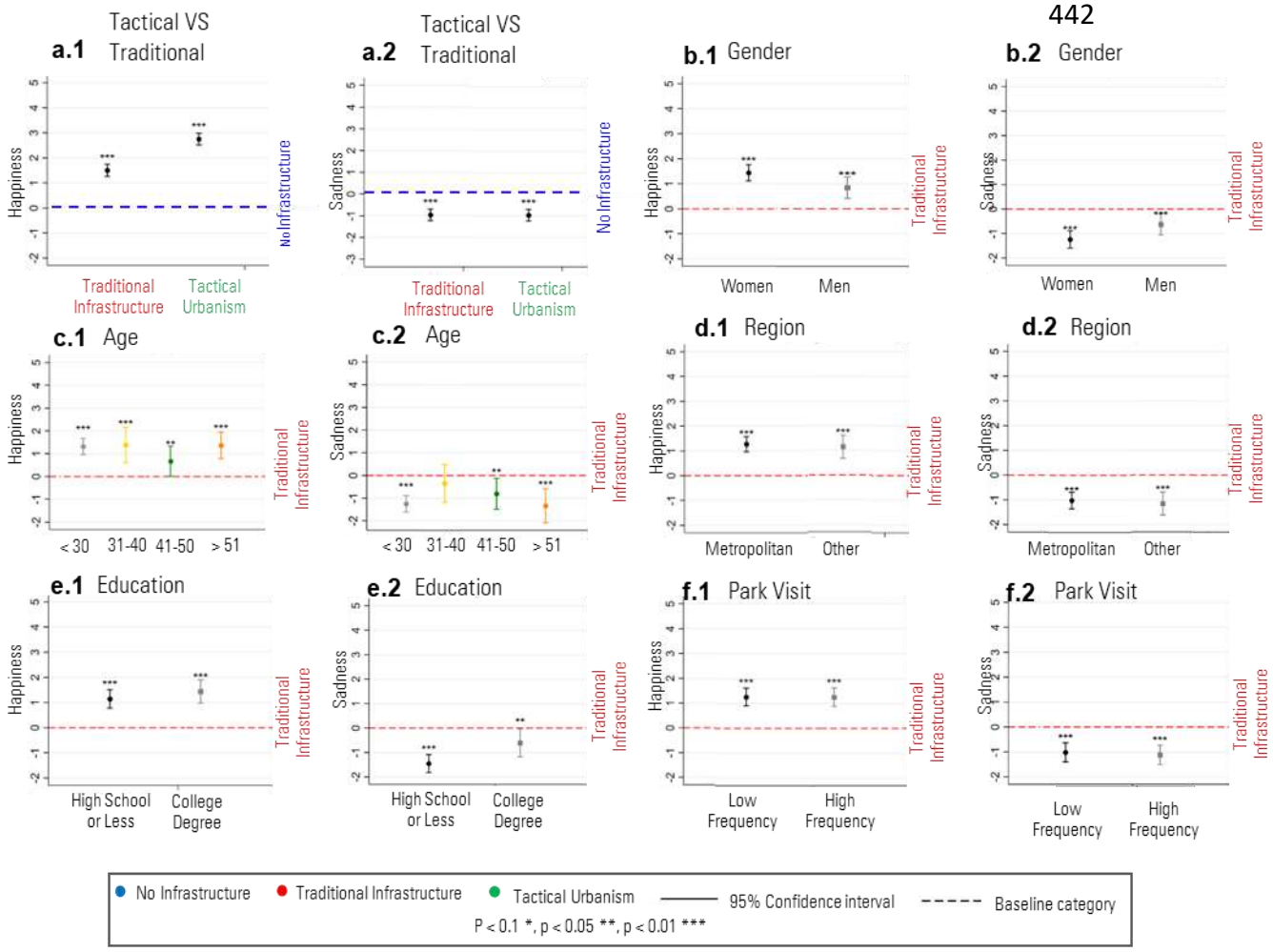
426 The following section presents the results of our study. The central objective is to analyse which
427 types of TU infrastructure generate a greater impact on people's perceived happiness and
428 sadness, and to compare outcomes for TU to those for traditional infrastructure solutions.

429 ### *4.1.1 Does Tactical Urbanism Have an Impact?*

430 Figure 3.a displays the impact of traditional infrastructure (henceforth TI) and TU on perceived
431 happiness and sadness. It can be seen that both types of urban infrastructure generate a
432 significant increase in happiness and a decrease in perceived sadness on the part of the
433 participants. At the same time, TU is observed to have almost double the impact with respect
434 to TI for both emotions (Estimate[happiness]= 2.749, SD= 0.120, $p< 0.001$; Estimate[sadness]=
435 -2.028, SD= 0.136, $p< 0.001$). These results are robust according to the addition of controls (see
436 Table A.1 in the Appendices). This suggests that TU is not an empty or precarious "placebo"
437 urbanism, but rather an alternative form of urbanism that generates a tangible impact on the
438 perceived emotional well-being of citizens in public space.

439 **Fig. 3** Impact of Traditional Infrastructure and Tactical Urbanism on Perceived Happiness and
440 Sadness

441



443

444 4.2 Overall Results by Sociodemographic Characteristics

445 The results are then analysed with respect to a series of sociodemographic variables to establish
446 whether these effects are restricted to certain population groups. Specifically, we analyse the
447 difference in the impact on emotional SWB of both infrastructures according to gender, age,
448 region of residence, educational level attained, frequency of visiting parks and squares (see
449 Table A.2 in the Appendixes). Figure 3.b displays the differences between perceived happiness
450 and sadness according to gender for TU as compared to TI interventions. A significant
451 improvement in happiness and reduction in sadness can be seen with TU for both males and
452 females. However, women experience both more happiness and less sadness than men in spaces
453 with TU (Happiness: Estimate[women]= 1.438, SD= 0.163, p< 0.001; Estimate[men]= 0.847,
454 SD= 0.219, p< 0.001; Sadness: Estimate[women]= -1.241, SD= 0.179, p< 0.001;
455 Estimate[men]= -0.629, SD= 0.217, p< 0.001).

456

Figure 3.c shows perceptions of happiness and sadness produced by TU with respect to TI according to age range. A significant increase in perceived happiness and reduction in perceived sadness can be seen with TU for all age groups, with the exception of sadness for participants aged 31-41 years. In TU spaces, happiness perception increases with a similar effect for all age groups (Estimate[<30]= 1.315, SD= 0.179, p< 0.001; Estimate[31-40]= 1.381, SD= 0.395, p= 0. 001; Estimate[>51]= 1.361, SD= 0.296, p< 0.001), with the exception of the 41-50 age group, where happiness increases with less intensity (Estimate[41-50]= 0.668, SD= 0.335, p< 0.001). With regard to sadness, TU decreases perceived sadness for all age groups by similar magnitudes, but with a larger effect for those below 30 and above 50 years old (Estimate[<30] = -1.253, SD = 0.183, p<0.001; Estimate[>50] = -1.335, SD = 0.381, p<0.001). We find no significant effect for the group aged between 31 and 40 years.

Figure 3.d displays the results for participants residing in the Santiago Metropolitan Region (SMR) versus other regions of the country. It can be seen that TU significantly improves happiness by similar magnitudes for participants residing in the SMR (Estimate= 1.268, SD= 0.157, p< 0.001) and for those residing in other regions of the country (Estimate= 1.149, SD= 0.239, p< 0.001). Likewise, perceptions of sadness decrease for both groups with comparable effects (Estimate[SMR]= -1.016, SD= 0.172, p< 0.001; Estimate[others]= -1.155, SD= 0.237, p< 0.001).

To analyse the results by education level, participants were divided into two groups: (1) high school or lower, and (2) university degree. Figure 3.e shows that TU significantly improves happiness and reduces sadness for both groups: the effect sizes for happiness are similar for both groups (Estimate[university]= 1.439, SD= 0.234, p< 0.001; Estimate[high school or lower]= 1.142, SD= 0.187, p< 0.001), however TU has a greater decrease in perceived sadness for the high school or lower group (Estimate= -1.453, SD= 0.187, p< 0.001), compared to the university degree group (Estimate= -0.608, SD= 0.290, p< 0.001).

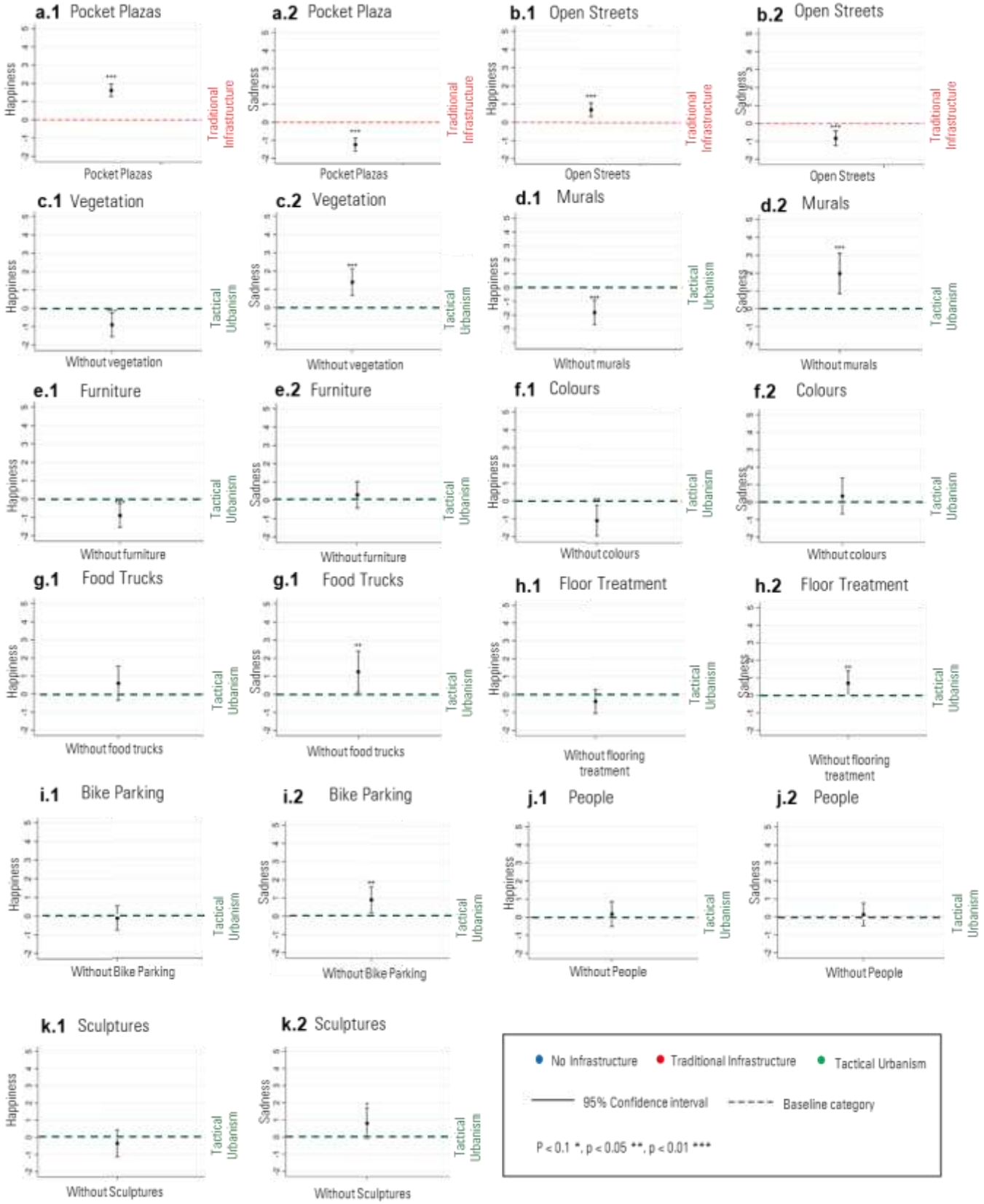
Figure 3.f shows the impact of TU according to the frequency with which participants visit plazas or parks, serving as a proxy for public space use. Participants were divided into two categories on this measure: high frequency and low frequency of use. For both groups, with respect to TI approaches, TU significantly increases happiness (Estimate[Low]= 1.257, SD= 0.181, p< 0.001; Estimate[High]= 1.254, SD= 0.187, p< 0.001) and decreases sadness (Estimate[Low]= -1.016, SD= 0.195, p< 0.001; Estimate[High]= -1.119, SD= 0.197, p< 0.001) with a comparable effect.

489

490 4.3. Results by Type of Tactical Urbanism

491 In this section, we analyse whether these increases in perceived happiness and reductions in
492 perceived sadness are dependent on the type of TU implemented (see Table A.3 in the
493 Appendixes). For this, we analysed two categories of intervention type: pocket plazas and open
494 streets.

495 **Figure 4.** Impact of Tactical Urbanism according to type of element.



496 A significant increase in happiness and reduction in sadness for both the pocket plaza and open
497 streets options can be seen in Figures 4.a and 4.b. However, the pocket plaza approach has
498 greater effects, both more strongly increasing happiness (Estimate[PP]= 1.622, SD= 0.174, p<

0.001; Estimate[OS]= 0.715, SD= 0.195, p< 0.001) and reducing sadness (Estimate[PP]= -1.242, SD= 0.187, p< 0.001; Estimate[OS]= -0.826, SD= 0.207, p< 0.001). This shows that the extent of the effect of TU on emotional SWB is dependent on the types of interventions used.

Overall, the evidence thus far shows that TU solutions lead to significant increases in happiness and reductions in sadness when compared to TI solutions for virtually all population groups and intervention types, providing robust evidence that refutes the criticism that characterises TU as "empty urbanism". Rather, our evidence shows that TU should be considered a relevant solution for improving the emotional SWB of inhabitants in the public space.

4.4 Overall Results According to Elements

In this last section, we seek to identify which elements of TU most strongly trigger these significant impacts on happiness and sadness – i.e., to determine the key ingredients of TU. To do this, we created a second TU photo-simulation for each scenario in which a characteristic element of TU had been subtracted, and compared the outcomes for happiness and sadness against the original TU photo-simulation. In all, nine elements were removed: people, greenery, urban furniture, food trucks, murals, floor treatment, bicycle parking, colours and sculptures (See the "Treatment C" column in Figure 1). For details all results are contained in Table A.4 in the Appendixes.

Figure 4.c shows the impact on both emotions when removing greenery from TU interventions, giving a significant decrease in happiness (Estimate= -0.896, SD= 0.339, p= 0.009) and increase in sadness (Estimate= 1.346, SD= 0.380, p< 0.001). A similar result is obtained by removing murals from TU interventions (see Figure 4.d) (Estimate[Happiness]= -1.699, SD= 0.459, p< 0.001; Estimate[Sadness]= 1.850, SD= 0.592, p= 0.002).

As Figure 4.e shows, the absence of street furniture significantly decreases happiness (Estimate= -0.945, SD= 0.327, p= 0.004), but does not affect participants' perceived sadness. The same is true when removing the strong colours that characterise TU (Fig. 4.f) (Estimate= -1.158, SD= 0.440, p= 0.009). The inverse impact can be seen in Figures 4.g, 4.h and 4.i, where the removal of food trucks, floor treatments and bike parking respectively increase perceived sadness (Estimate[Food Trucks]= 1.371, SD= 0.571, p= 0.017; Estimate[Floor]= 0.696, SD= 0.353, p= 0.049; Estimated [Bike parking]= 0.930, SD= 0.362, p= 0.011), but do not affect perceived happiness. As figures 4.j and 4.k show, we did not find any effect on the removal of people and sculptures on participants' happiness or sadness when compared to TI interventions.

To summarise, we can consider the essential elements of TU to be greenery (specifically in planters), murals, eye-catching urban furniture, colours, food trucks, floor treatment and bicycle parking. Of these, the greatest impact on emotional SWB is generated by greenery and murals.

5. Discussion

The main objective of this research has been to provide evidence on whether TU constitutes an urban planning solution that improves people's emotional SWB. Given that the COVID-19 pandemic and associated lockdowns highlighted the value of public space to well-being and led to the expansion of opportunities for TU, our research tests for any connection between these two elements. Ultimately, we were able to demonstrate that TU is an approach that improves emotional SWB in public space, seeing an increase in happiness and decrease in sadness when compared to traditional urban planning solutions. This corroborates the argument that TU is not a "sticking-plaster" solution that distracts from long-term goals (Mould, 2014; Fuentes, 2018), but rather an alternative urbanism solution that impacts and improves people's emotional SWB. We were also able to show that these impacts affected all population groups analysed, including when accounting for demographic variables such as place of residence and frequency of use of public space. Among these demographics, the groups that benefit most from TU improvements are women and groups with higher educational levels.

Of the TU interventions analysed, pocket plazas generated greater increases in people's emotional SWB than open streets, suggesting that improvements in emotional SWB are dependent on the type of TU used. Expanding further on this finding, we showed the most impactful elements of TU interventions were the incorporation of greenery, murals, street furniture, colours, food trucks, floor treatment and bicycle parking. The particularly strong impact of small-scale greenery and murals empirically corroborates earlier findings that green infrastructure produces a positive impact on happiness (Navarrete-Hernandez & Laffan, 2019; 2023) and that murals are able to elevate the aesthetic qualities of a public space by providing a recognisable identity (Lak & Zarezadeh, 2020). On the other hand, we identified that the presence of people and sculptures are not impactful factors for participants' emotional responses. Again, returning to the experience of the COVID-19 pandemic, it appears that access to the public realm has intrinsic value beyond simply providing access to other people.

Along with demonstrating the relevance of TU in and of itself, these results invite us to return to the relationship between TU and the traditional planning and delivery of infrastructure. First, rather than focusing on TU simply as a rapid and low-durability intervention complementary to strategic spatial

planning, our results suggest the importance of how we might, following Vallance and Edwards (2021), make "strategic spatial planning become more tactical" (719). This means that TU could be integrated as a strategy that bridges the gap between low-cost testing (fail-fast, fail-cheap) and the construction of long-term effective interventions, such as has been done in Times Square in NYC (Lydon & Garcia, 2015). This further involves the incorporation of those particular characteristics that drive improvement in people's SWB from TU – for example, strong colours, murals and platters – into more standard planning solutions (Vallance & Edwards, 2021). It is important also that these features are preserved when an intervention makes a transition from temporary to permanent, and that it is not only the more functional features and the overall layout that are preserved, for instance as has been the case in Milan's Piazze Aperte. Furthermore, as Vallance and Edwards (2021) explain, we might also ask what traditional planning can learn from TU, bringing into discussion the need for traditional infrastructure to incorporate the more effective elements of this study and others like it, so as to maximise improvements in citizen's emotional SWB. Finally, as TU evolves, issues of durability and maintenance costs must be addressed so that these can become effective long-term interventions. In this sense, the TU industry faces a steep learning curve, and must rapidly evolve to embrace the use of, for example, higher-quality material for outdoor construction, and paints that can endure climatic conditions, vandalism and the rigors of daily use (Lydon et al., 2016).

This research does however have limitations. While the study has strong internal validity, the findings cannot be generalised to other populations due to the characteristics of the sample used. Our study uses a convenience sample, and so we can only derivate causal emotional differences for those within this group. For instance, our sample is composed of Chileans, meaning our population has specific cultural traits, and therefore our results will not necessarily hold for populations in other countries. Future research could address this country- or city-level local generalisability by running this experiment in a representative sample. In addition, researchers could enhance cross-country comparability by running the same experiment with representative samples across cities in different regions, for example in Asia, Europe and America. While we do not expect a priori that the results will be reversed, it is possible that results might become non-significant or have lower estimates in other cultural contexts – for instance, where there have been previous negative experiences with projects of this type.

A further limitation of our study is our use of only still images. Ultimately, our causal claims are limited in being able to say that mild visual-static stimuli trigger changes in perceived happiness and sadness in public spaces. However, real-life urban experiences are fundamentally multi-sensorial (Ojala et al., 2022). The decision to employ photo-simulation techniques was primarily driven by their ability to provide a low-cost strategy for visualising infrastructure interventions, thus presenting a tool that is economically accessible to researchers and planners in the developed and the developing world. Although it might produce a lower accuracy, this strategy arguably provides a conservative lower-bound

estimate, as studies using more immersive technologies – such as VR – show a same-direction effect with an increased magnitude (Ojala et al., 2022; Rossetti & Hurtubia, 2020). We therefore expect that, if a simple image can trigger a negative emotion, a more immersive or realistic experience would trigger a stronger reaction in the same direction (Navarrete-Hernandez & Afarin, 2023).

Another limitation of our study is that we are only able to analyse the short-term emotional effects of TU interventions, and cannot observe any potential long-term effects of prolonged exposure. One plausible possibility is that, at the neighbourhood level, the emotional impact of continuous exposure to an intervention over time 'wears off' on residents, or at a city scale, that the increased presence of TU in a given city sees its effects diminishing across its population. Therefore, our results present only a snapshot of the present moment of initial exposure.

Furthermore, we test the impact of TU interventions of various types on two emotions, happiness and sadness, as proxies of positive and negative affects respectively. Other positive and negative emotions might lead to different magnitudes and directionalities. Our selection was restricted by sample size and budgetary constraints, however further research could explore how the results vary with a larger standardised set of emotions, for example the full set of emotions proposed by the Positive and Negative Affect Schedule (PANAS).

Finally, when modeling TI solutions, we selected standard solutions found in Santiago de Chile leading to the exclusion of other potential TI designs. For instance, more aesthetically pleasing or innovative programmes might produce different outcomes. Additionally, a limited number of images were presented when performing the experiment, evaluating only two types of TU interventions. By excluding other TU typologies, such as parklets, the possibility of evaluating emotional SWB in different spaces and using other elements was restricted. Furthermore, the variety of TU intervention typologies and elements expands, these new sets need to be tested. That said, we have demonstrated how different TU elements trigger varying levels of emotions across two commonly used typologies. Further application of the proposed methodology can help expand this evidenced-based urban planning and design TU toolkit.

6. Conclusions

Through this research, perceived emotional SWB was measured at sites of TU interventions. The experiment, based on photographic simulations, has evaluated the perception of happiness and sadness in public space, comparing scenarios of TU and TI for 390 Chilean participants. The results show that the photo-simulation serves as a suitable tool for conducting this research, since the responses yielded results consistent with the expected impact of TU on emotions.

By carrying out the experiment, we were able to demonstrate that the transformation of vacant urban areas and vehicular streets into spaces of TU significantly increases perceived happiness and reduces perceived sadness when compared to TI solutions. The strongest impact on both happiness and sadness together is expressed most strongly for women, and the impacts of happiness and sadness alone is more pronounced in adults and young people, respectively. The results show us that TU is not an empty approach to urbanism, but rather plays a fundamental role in improving people's emotional SWB. This is made possible through the incorporation of new elements and activities into public space, the most relevant being greenery, colours and murals, and with the TU typology of pocket plazas having a greater impact than open streets.

While TU has much to learn from traditional urbanism when ensuring that infrastructure remains durable and relevant over time, this research also shows that, conversely, traditional approaches must draw from TU to improve their impact on people's emotional SWB in public space. The use of the results of this research sheds light on potential improvements to TI practices. At the same time, through a photo-simulation methodology, this research has demonstrated a flexible tool that can be used to assess, ex-ante, the impact of new TU and TI proposals, allowing us to define urban planning solutions that truly maximise the emotional well-being of people in public space.

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9. Appendixes

Table 1. Impact of Tactical Urbanism

A. Perception by site

	Happiness		Sadness	
VARIABLES	(1)	(2)	(1)	(2)
Treatment A	1.505***	1.509***	-0.960***	-0.955***
	(0.124)	(0.124)	(0.138)	(0.137)
Treatment B	2.750***	2.766***	-2.028***	-2.027***
	(0.120)	(0.120)	(0.136)	(0.135)
Controls	No	Yes	No	Yes
Constant	3.386***	4.422***	5.723***	5.910***
	(0.0856)	(0.532)	(0.0971)	(0.699)
Observations	2,079	2,068	1,895	1,878
R-squared	0.201	0.216	0.105	0.128

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2. Impact of Tactical Urbanism according to gender, age, region of residence, level of education achieved, frequency of visiting traditional squares, and frequency of walking in pedestrian walks.

D. Perception by educational level

	Happiness		Sadness	
VARIABLES	High School	College Degree	High School	College Degree
Treatment B	1.143***	1.439***	-1.453***	-0.608**
	(0.188)	(0.235)	(0.187)	(0.290)
Constant	4.902***	5.014***	4.753***	4.614***
	(0.138)	(0.170)	(0.134)	(0.203)
Observations	1,296	949	1,253	682
R-squared	0.066	0.095	0.084	0.046

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

E. Perception by frequency of visiting traditional squares

	Happiness		Sadness	
VARIABLES	Low Frequency	High Frequency	Low Frequency	High Frequency
Treatment B	1.257***	1.255***	-1.017***	-1.119***
	(0.182)	(0.188)	(0.196)	(0.198)
Constant	4.634***	5.173***	4.652***	4.878***
	(0.134)	(0.135)	(0.141)	(0.141)
Observations	1,468	1,306	1,290	1,221
R-squared	0.071	0.080	0.064	0.045

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

F. Perception by frequency of walking on pedestrian streets

	Happiness		Sadness	
VARIABLES	Low Frequency	High Frequency	Low Frequency	High Frequency
Treatment A	1.181***	1.269***	-1.260***	-0.990***
	(0.292)	(0.146)	(0.261)	(0.164)
Constant	4.871***	4.897***	4.670***	4.802***
	(0.220)	(0.105)	(0.186)	(0.118)
Observations	699	2,075	745	1,766
R-squared	0.064	0.078	0.054	0.055

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Impact of Tactical Urbanism according to typology: pocket plazas and open streets.

A. Perception by Tipoloy: Pocket Squares

	Happiness		Sadness	
VARIABLES	(1)	(2)	(1)	(2)
Treatment B	1.622***	1.647***	-1.242***	-1.260***
	(0.174)	(0.173)	(0.187)	(0.187)
Controls	No	Yes	No	Yes
Constant	4.961***	6.250***	4.818***	4.176***
	(0.126)	(0.677)	(0.132)	(0.930)
Observations	1,585	1,577	1,436	1,420
R-squared	0.111	0.130	0.060	0.081

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

B. Perception by Tipology: Open Streets

	Happiness		Sadness	
VARIABLES	(1)	(2)	(1)	(2)
Treatment B	0.716***	0.700***	-0.826***	-0.793***
	(0.196)	(0.195)	(0.208)	(0.205)
Controls	No	Yes	No	Yes
Constant	4.786***	5.849***	4.679***	5.196***
	(0.144)	(0.745)	(0.151)	(0.989)
Observations	1,189	1,182	1,075	1,063
R-squared	0.031	0.049	0.046	0.078

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4. Impact of Tactical Urbanism according to type of element.

A. Perception by element: People

VARIABLES	Happiness (1)	Sadness (2)
Treatment B	0.126	0.173
	(0.320)	(0.349)
Treatment C	-1.399***	0.773**
	(0.287)	(0.305)
Constant	5.416***	4.120***
	(0.223)	(0.241)
Observations	395	360
R-squared	0.086	0.021

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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B. Perception by element: Vegetation

VARIABLES	Happiness (1)	Sadness (2)
Treatment B	-0.894***	1.402***
	(0.334)	(0.371)
Treatment C	-2.408***	2.238***
	(0.294)	(0.318)
Constant	6.029***	3.621***
	(0.236)	(0.257)
Observations	398	359
R-squared	0.156	0.122

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

C. Perception by element: Urban Furniture

VARIABLES	Happiness (1)	Sadness (2)
Treatment B	-0.896***	0.303
	(0.327)	(0.362)
Treatment C	-1.680***	0.385
	(0.274)	(0.313)
Constant	6.020***	4.333***
	(0.225)	(0.264)
Observations	395	358
R-squared	0.089	0.004

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

D. Perception by element: Food Truck

VARIABLES	Happiness (1)	Sadness (2)
Treatment B	0.595	1.256**
	(0.481)	(0.573)
Treatment C	-1.668***	1.341***
	(0.394)	(0.479)
Constant	6.500***	3.444***
	(0.325)	(0.393)
Observations	199	178
R-squared	0.158	0.046

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

E. Perception by element: Murals

VARIABLES	Happiness (1)	Sadness (2)
Treatment B	-1.774***	1.982***
	(0.447)	(0.577)
Treatment C	-3.981***	3.353***
	(0.373)	(0.508)
Constant	7.093***	2.763***
	(0.300)	(0.429)
Observations	197	180
R-squared	0.379	0.201

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

F. Perception by element: Soil Treatment

VARIABLES	Happiness (1)	Sadness (2)
Treatment B	-0.397	0.696**
	(0.340)	(0.353)
Treatment C	-1.768***	1.715***
	(0.282)	(0.305)
Constant	6.213***	3.520***
	(0.227)	(0.240)
Observations	395	356
R-squared	0.105	0.086

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

G. Perception by element: Bicycle Parking

VARIABLES	Happiness (1)	Sadness (2)
Treatment B	-0.144	0.930**
	(0.327)	(0.363)
Treatment C	-2.064***	1.831***
	(0.294)	(0.306)
Constant	6.242***	3.576***
	(0.241)	(0.245)
Observations	398	359
R-squared	0.153	0.093

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

H. Perception by element: Colors

VARIABLES	Happiness (1)	Sadness (2)
Treatment B	-1.041**	0.353
	(0.436)	(0.525)
Treatment C	-3.050***	1.889***
	(0.394)	(0.463)
Constant	6.898***	3.564***
	(0.319)	(0.390)
Observations	197	182
R-squared	0.257	0.111

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

I. Perception by element: Sculptures

VARIABLES	Happiness (1)	Sadness (2)
Treatment B	-0.357	0.803*
	(0.399)	(0.453)
Treatment C	-1.460***	1.230***
	(0.356)	(0.388)
Constant	5.745***	3.615***
	(0.281)	(0.305)
Observations	200	179
R-squared	0.090	0.054

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1