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a cura di / edited by
Maria De Santis, Luca Marzi,
Simone Secchi, Nicoletta Setola

SPECIE DI SPAZI

Promuovere il benessere psico-fisico attraverso il progetto

SPECIES OF SPACES

Fostering psycho-physical well-being by design

SITdA
Società Italiana della Tecnologia dell'Architettura

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Il presente volume riporta parte del risultato di una attività di ricerca inter universitaria che si colloca nel più ampio programma del Cluster AA della SITdA che aggrega studiosi, ricercatori e docenti universitari con competenze specifiche della disciplina della Tecnologia dell'Architettura costituendosi quale luogo di scambio di informazioni, di conoscenza e di confronto, anche con funzione di sensore dei contesti per una progettazione tecnologica in chiave inclusiva di soluzioni accessibili.

Il volume è stato realizzato dal Cluster Accessibilità Ambientale della Società Italiana della Tecnologia dell'Architettura con il patrocinio del Dipartimento di Architettura dell'Università degli Studi di Firenze, dell'Istituto Nazionale di Urbanistica e dell'Istituto per l'innovazione e trasparenza degli appalti e la compatibilità ambientale (ITACA).

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Insightful Design of Tactile Pavings for "Social Fabric" Preservation

Preservare il tessuto sociale attraverso un'attenta implementazione dei sistemi informativi tattili

Il "tessuto sociale" che costituisce le nostre comunità è composto da persone che percepiscono e vivono gli spazi urbani in modo differente. È quindi necessario progettare spazi che si adattino alle abitudini e alle esigenze di tutti gli utenti; questo diventa particolarmente importante per consentire la fruibilità alle persone con disabilità. Negli ultimi vent'anni sono state progettate e applicate diverse soluzioni per consentire alle persone con disabilità una fruizione autonoma della città, ma molte sono postume e hanno modificato l'aspetto dei luoghi creando nuove barriere architettoniche involontarie. Un esempio è quello delle pavimentazioni tattili che, progettate per aiutare i disabili visivi, possono modificare il modo in cui altri utenti, come quelli con difficoltà motorie, si muovono. Si apre quindi un dibattito su come creare luoghi più inclusivi, capaci di adattarsi positivamente alle diverse esigenze. Questo contributo vuole esaminare come gli spazi possano essere (ri)progettati attraverso un uso più attento di questi ausili. In un primo momento, si analizzano le pavimentazioni tattili per comprenderne le caratteristiche e l'applicazione. Successivamente, viene indagato il rapporto di questi sistemi con contesto e diversi utenti, per capire come si modificano i luoghi e quando si creano barriere architettoniche involontarie. Si studiano poi possibili soluzioni per garantire l'inclusività e coordinare la progettazione, analizzando possibili buone pratiche.

Chiara Scanagatta Università Iuav di Venezia, Dipartimento di Culture del Progetto. PhD in Tecnologia dell'architettura presso l'Università Iuav di Venezia, dove lavora come assegnista. La sua ricerca si concentra sulla progettazione sostenibile, sistemi costruttivi innovativi e tecnologie digitali per la manutenzione degli edifici.

Introduction

Urban spaces are defined both by the buildings that delineate the space and, mostly, by the people who live in and use them; this idea is supported by both the concept of *genius loci* and of "social fabric".

The first concept was coined by Norberg-Schulz (1979) who studied how a building, or any other designed object, should always be connected to, e.g., the place where it is built, what materials are available, what is the purpose; moreover, he stated that a place is "a space with a distinctive character [and is made of] a set of concrete things with their material substance, form, texture and colour. All together, these things define an 'environmental character' that is the essence of the place" (Norberg-Schulz, 1979, pp. 6, 8).

At the same time the "social fabric" concept was first coined by artist Tim Laurel, as he suggested that people's bonds can contribute to the formation of a culturally rich and socially cohesive community; thus, the "social fabric" consists of people who perceive and experience urban spaces differently. Therefore, since places have distinctive characteristics and communities are made from a variety of people, there is a need to design urban spaces that keep their character and suits all different users' habits and needs; this becomes particularly important to allow accessibility for people with disabilities.

However, it is no easy task to design spaces accessible for all since different impairments have different needs; one example is that of the sometimes-opposing needs visually impaired people have compared to mobility impaired. Hereafter, the focus of this contribution is to make a review of how the unobservant use of aids as Tactile Pavings can change spaces' characteristics and – unintentionally – produce architectural barriers, while a more insightful design could help preserving the *genius loci* of a place without compromising the "social fabric"; in fact, the issue with Tactile Pavings raises from their design which presents contrast tones – not coherent with most spaces – and bumpy surfaces – which make movements more difficult for some users.

The first aids serving the visually impaired (i.e., blind and partially sighted) were designed and developed in 1965 by engineer Seiichi Miyake; these were studied to enable such users to orient themselves independently in space. In the beginning he designed two elements, so called "tactile bricks", that featured raised elements: dots and lines. The first one suggested pedestrian to pay attention to possible obstacles or dangers. The second signalled the possibility to continue moving in the direction suggested by the orientation of the lines themselves. The elements, with slight adjustments, are internationally in use since 1985 and are the basis of Tactile Indicators and Pavings. Later, the ISO 23599:2012, entitled *Assistive Products for Blind and Vision-Impaired Persons - Tactile walking surface indicators* (TWSI), was published as outcome of the 2007 United Nations *Convention on the Rights of Persons with Disabilities*. Updated in 2019, the standard establishes guidelines on the use and installation of Tactile Indicators, and it also defines the two functions performed by these systems: signal possible dangers and obstacles (e.g., pedestrian crossing) and indicate routes to points of interest (e.g., post office, train tracks). The same ISO also refers to the need to apply certain differences in use at local level, to consider cultural or other differences.

Despite its benefits and extensive norm, Tactile Pavings can, indirectly and unwittingly, become architectural barriers for other users with mobility impairments, which affect a much larger group of people including elderly, or fully fit people whose movement is limited, e.g., pushing a pram, carrying heavy luggage (Gil-Mastalerczyk *et al.*, 2023); thus, it is important to understand how to improve Tactile Indicators design and their application.

In the next sections the relationship of these systems with the context and different users will be investigated; possible solutions to guarantee an Inclusive Design are studied, and proposed good design practices are analysed.

Tactile Walking Surface Indicators review

Different researchers studied Tactile Pavings in relation to the surrounding context, their installation, and the relationship with users without visual impairments. Starting from the relationships of TWSI with the surrounding context, Lauria (2017) studied how it is possible to work with different materials to preserve the environment's appearance when it comes to design accessibility in cultural heritage. This is achievable by using a different type of Tactile Paving, called Contrasting Walking Surface Materials (CWSM), which is based on the appropriate combination of common paving materials; it is designed after the Universal Design principles, and its detectability is possible through "sensory contrast between adjacent walking surfaces implemented through common paving materials. [CWSM] aspire to integrate into the surrounding context without revealing their communicative purposes and the reference user group" (Lauria, 2017, p. 6).

Another consideration is that, even if TWSI have some common features and need to comply with international standards, they must be designed in accordance with each national users' perceptual characteristic, to fit the "anthropometric dimensions of the nation while considering both genders" (Demirkan, 2013, p. 50).

Furthermore, if we consider how TWSI are used within urban contexts, Pinto *et al.* (2020) research gives a deep analysis on the importance of the correct installation of Tactile Indicators, since the inaccurate implementation can increase the risk of tripping not only of elderly or users with mobility impairments, but also for people with visual impairments who might not notice unevenness in pavings. This maintenance issue can be traced back to the lack of knowledge of dwellers who are not always aware of the correct meaning of Tactile Indicators or the possible problems these may cause for other users which are exacerbated in the event of, e.g., surface disruption.

Moreover, studies on how others interact with Tactile Pavings showed that users with different needs have a set of diversified experiences and answer differently to their implementation; while Tactile Pavings are of extreme importance to help visually impaired in navigating through open spaces with no or poor references, for other users they can become obstacles to overcome. In fact, Luk and Siu (2023) analysed how TWSI are studied to support visually impaired and, considering a rapidly ageing population and a growing number of wheelchair users, how these can create potential safety hazards when combined with low maintenance.

To better understand how users interact with Tactile Pavings, Bentzen *et al.* (2020) did specific tests on the effects of crossing TWSI based on parameters as effort, stability, slipping and trapping; their research showed how raised-bar Tactile Pavings with the bars aligned perpendicular to the direction of the crosswalk – which implies that these are parallel to the direction of travel on the sidewalk – help pedestrians who are visually impaired in locating crosswalks and align to cross, but the crossing surface has some adverse effect on people with mobility impairments. Ormerod *et al.* (2015), on the other hand, extensively studied the effects of the presence of Tactile Pavings on wheelchair users, and they also differentiated the perception of self-propelled wheelchair users and that of users being pushed by another person.

Considering elderly users, Pires Rosa *et al.* (2021) analysed how their needs are divergent from the ones with visual disabilities, since older people in the outdoor environment have a fear of falling or feeling unstable on tactile surfaces, especially on kerbs, and are therefore against the presence of tactile aids.

Analysed research showed how the improper installation of Tactile Pavings leads to poor preservation of the surroundings and has also shown evidence of possible adverse effects that pedestrians and people with impairment face, even when no maintenance issues are detected (Fig. 01 and Fig. 02). Nevertheless, some possible solutions can be implemented to improve TWSI.

Fig.01 No references when Tactile Pavings end.
Fig.02 Poor references when Tactile Pavings end.

Results

As abovementioned, Lauria (2017) stated that to have more accessible spaces there is the need of having places capable of "narrating" their qualities to help users in a significant way, and this is true for visually impaired and other users as well. In fact, throughout the different elements comprising collective spaces, pavements play an important role since, e.g., by using visual contrast it is possible to help visually impaired users while both integrating such aids in heritage contexts and avoiding some of the possible architectural barriers. Therefore, Lauria (2017) suggests that CWSM could find their application in design strategies aimed at increasing the spatial orientation and mobility of blind people in places of cultural heritage. Besides, for Lauria (2017, p. 27) "the field of application of TWSI should be limited to warning of danger in those environmental situations that are easier to standardize [...] with the aim of minimizing the used amount of TWSI surface in order to compensate for the discomforts they cause to the elderly and to people with walking difficulties." The same suggestion comes from Bentzen et al. (2020) who state that Tactile Pavings should be used in locations where crossing takes place and indicators cannot be avoided but should be minimized in other areas due to the potential impact on people with mobility impairments.

Thence, while visually impaired would like to use Tactile Indicators to freely move and would be open to use alternative solutions to reduce the impact of such indicators in the urban context, other users – with or without mobility impairments – have remarks on TWSI; these are mostly due to their incorrect placement (Fig. 03), and to some of their features which can create difficulties while moving. This becomes more evident when designers use, for better architectural context integration, "leading elements designed as wide metal paths with a groove in the middle along the tactile paving, which seriously affected adhesion to the surface and proper manoeuvring by people on wheelchairs." (Mikucka *et al.*, 2021). Furthermore, considering how Tactile Pavings are installed and the different needs that mobility and visually impaired users have, other issues raise.

Fig.03 Incorrect placement of Tactile Indicators due the proximity to an obstacle.

Demirkan (2013) studied how pedestrians tend to keep a certain distance from the carriageway, or obstacles, thus pedestrian areas should include a "buffer zone" which represents a safety space – an extension of the pavement; these should have a different material texture and colour – as suggested also from Lauria (2017) – to inform users that they are moving outside the pavement, and to "guide" the ones with perception disorders. The more challenging aspect is the definition of the width of such zone since it should ensure the right distance from obstacles while allowing visually impaired to reach with the white cane orientation elements as building walls. The same research showed how the elements chosen for pedestrian areas should guarantee a hard and even surface, durable on a long operating period, to secure proper mobility not only for wheelchair users, but also for, e.g., prams or women in heels (Demirkan, 2013).

Luk and Siu (2023) also suggest using a combination of different materials for pavings, since by using rough textured surfaces to better indicate paths and boundaries, visually impaired would still be able to autonomously move and mobility impaired would not encounter problems in their movements. Another possible solution regards the height of tactile indicators; Luk and Siu (2023) indeed suggest reducing the height of tactile indicators blisters to, e.g., 2.5 mm.

Same advise comes from Pinto *et al.* (2020) as they state that a better use of colour contrasts could help both partially sighted and older people to easily detect possible obstacles and dangers; furthermore, to them as well, the use of smaller blisters in Tactile Indicators would allow to reduce fall hazards by minimizing changes in levels.

Pires Rosa *et al.* (2021) on the other hand, while supporting the opportunity or reducing TWSI's height, affirm that the least acceptable height detectable by someone feet is of 4 mm, and lower heights would not be sufficient; moreover, in their opinion such height would not cause discomforts to wheelchair users and elderly pedestrians. Other solutions proposed by Pires Rosa *et al.* (2021) are aimed at resolving kerbs' issues, since they function as guide for visually impaired, but results in an architectural barrier for mobility impaired.

Fig.04 Extra security aid due to Tactile Indicators with no tonal contrast with the surrounding paving.

Ormerod *et al.* (2015) suggested that to allow access for wheelchair users, while providing a guide and warning for visually impaired, creating a lower height kerb with a small upstand could be a viable solution, but no optimum upstand height could be identified since the needs of the two users' groups are so different. Ormerod *et al.* (2015) study also showed how level access is essential for the majority of wheelchair users in order to cross the carriageway, and it is reached by either lowering kerbs to carriageway level or raising the entire road crossing point; both solutions can create difficulties for visually impaired people who are no longer able to navigate effectively along the footway because their navigation aid – namely the kerb – has been removed where they need it the most to safely move along a path. This led to their suggestion of reconsidering wheelchairs' design – since many have not been designed to move on uneven surfaces as they do not have shock absorbers – to reach a more inclusive use of public spaces, but this would put all the effort on a certain category of users rather than improving the spaces for everyone. Ormerod *et al.* (2015) research also showed that some Tactile Pavings present the wrong colour since sometimes it has little or no tonal contrast with the surrounding paving (Fig. 04), creating orientation issues for pedestrian with reduced vision; furthermore, the visually impaired people they interviewed stated that safer pavements in the context of preventing falls on pavements should be a higher priority than the installation of TWSI themselves (Ormerod *et al.*, 2015).

Moreover, there is a need to bear in mind what a growingly older population perceive as fall risk – e.g., grates and uneven sidewalks, streets with cobble stones, large puddles, multiple sources of traffic – as they are an increasing percentage of communities. This is highlighted also in Mizuno and Tokuda (2023) research, who studied possible hazardous areas when TWSI are installed. Their study showed that space between the Tactile Paving and the hazardous area, e.g., gaps between platforms and trains (Fig. 05), can result in trapping for mobility impaired and falls for elders and visually impaired, thus the implementation of Tactile Indicators along the boundary should be redesigned to avoid architectural barriers and tripping risks.

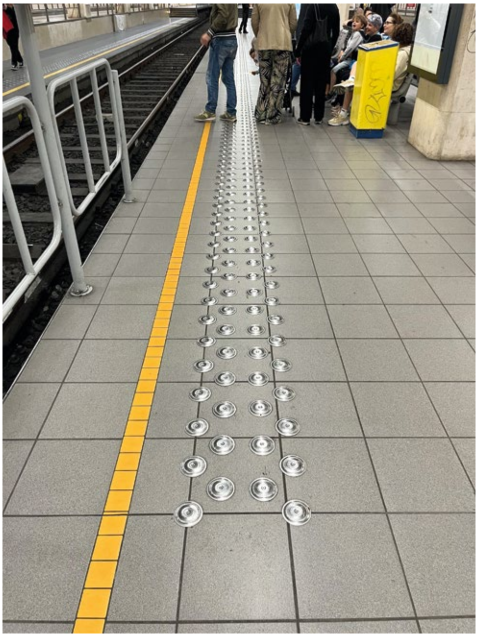

Fig.05 Wide gap between platforms and trains.
Fig.06 Colour contrast and integration of Tactile Pavings.

However, Thies *et al.* (2011) showed how most of the studies on TWSI, their application in cities, and the users' experience, were theoretical or conducted in controlled environments, with pavings in perfect conditions and TWSI laid according to national guidelines. But when we consider that the conditions of real environments are not ideal ones, since pavings are mostly uneven and part of the population has some sort of – at least – balance impairments, further analysis on the results of theoretical studies is needed.

Conclusions

In conclusion, it is possible to say that designing inclusive urban spaces – which embody the 'genius loci' idea of having a distinctive character that is the essence of the place while preserving the "social fabric" which is defined by a variety of people with different needs – is no easy task for designers; but, despite the difficulties, it is still possible to integrate different aids to help people to freely move around without completely changing architectural and semantic characteristics.

One preferable option would be of using combinations of different materials with different textures and contrasting colours (Lauria, 2017; Mikucka *et al.*, 2021; Ormerod *et al.*, 2015) to allow partially sighted to freely move while reducing possible obstacles for other users (Fig. 06), and to alert visually impaired of, e.g., the end of the boundary between kerbs and carriageways. Another possible implementation would be of using tactile indicators with a reduced blisters height (Demirkan, 2013; Luk and Siu, 2023; Mizuno and Tokuda, 2023; Ormerod *et al.*, 2015; Pinto *et al.*, 2020; Pires Rosa *et al.*, 2020) to avoid trapping issues for wheelchair users or fall risks for elderly, but only where mostly needed since it can be less detectable for visually impaired, and use ramps instead of single step solutions to overcome small height differences, since different users find it difficult to detect them (Demirkan, 2013). Furthermore, as Deichmann (2016) explains, it is possible to create accessible urban spaces without an extensive use of artificial pavings if traditional architectural elements are consciously used, meaning that it is possible to, at least, implement Tactile Pavings solutions able to preserve the 'genius loci' of a space.

The real opportunity then arises from the implementation of more thoughtful designs, which avoids to simply follow the minimum indications given on how to position TWSI in public spaces as Demirkan (2013), Lauria (2017), Mizuno and Tokuda, (2023), and Ormerod *et al.*, (2015) suggested; thus, such more attentive process would allow to create better spaces to preserve both the character of each space and the "social fabric" which is created in it.

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Il volume affronta il tema del benessere psico-fisico promuovendo l'inclusione nel progetto degli spazi e presentando i risultati di studi, ricerche e sperimentazioni progettuali, raccolti in occasione del convegno dal titolo *Specie di Spazi*, organizzato a Firenze il 20 novembre 2023. Il progetto che ha reso possibile questa antologia strutturata di esperienze nasce dalla volontà dei componenti del Cluster Accessibilità Ambientale della Società Italiana della Tecnologia dell'Architettura (SIT*d*A) di continuare il percorso di costruzione di un modello di riferimento scientifico interdisciplinare per una progettazione responsabile, declinata alle diverse scale, sempre più mirata alle persone e alla complessità dei diversi bisogni inseriti nell'ampio contesto della tutela e della promozione dei diritti umani.

This book addresses the theme of psycho-physical well-being by promoting inclusion in the design of spaces and presenting the results of studies, research, and design experimentations collected at the Conference entitled *Species of Spaces*, organised in Florence on 20th November 2023. This structured anthology of experiences stems from the desire of the members of the Environmental Accessibility Cluster of the Italian Society of Architecture Technology (SIT*d*A). The project aims to continue constructing an interdisciplinary scientific reference model for responsible design, declining at different scales, increasingly focusing on people and the complexity of the various needs in the broad context of protecting and promoting human rights.

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