



LEEDS
BECKETT
UNIVERSITY

Citation:

Awamleh, Z (2024) Behaviour setting transformation methodology, filling in the gaps of the conventional architectural design process. Philosophical Transactions of the Royal Society B: Biological Sciences, 379 (1910). pp. 1-11. ISSN 0962-8436 DOI: <https://doi.org/10.1098/rstb.2023.0292>

Link to Leeds Beckett Repository record:

<https://eprints.leedsbeckett.ac.uk/id/eprint/11260/>

Document Version:

Article (Accepted Version)

Creative Commons: Attribution 4.0

© 2024 The Author(s).

The aim of the Leeds Beckett Repository is to provide open access to our research, as required by funder policies and permitted by publishers and copyright law.

The Leeds Beckett repository holds a wide range of publications, each of which has been checked for copyright and the relevant embargo period has been applied by the Research Services team.

We operate on a standard take-down policy. If you are the author or publisher of an output and you would like it removed from the repository, please [contact us](#) and we will investigate on a case-by-case basis.

Each thesis in the repository has been cleared where necessary by the author for third party copyright. If you would like a thesis to be removed from the repository or believe there is an issue with copyright, please contact us on openaccess@leedsbeckett.ac.uk and we will investigate on a case-by-case basis.

BEHAVIOUR SETTING TRANSFORMATION METHODOLOGY, FILLING IN THE GAPS OF THE CONVENTIONAL ARCHITECTURAL DESIGN PROCESS

Author: Zaid Awamleh

Humanitarian Architect /Lecturer of Architecture at Leeds Beckett University, UK. 2024

e-mail: zaid.awamleh@live.com

 ZA, 0000-0003-0346-353X

Methodology Paper published in the **Philosophical Transactions B** by the Royal Society on August 2024

© 2024 All rights reserved

royalsocietypublishing.org/journal/rstb

Cite this article: Awamleh Z. 2024 Behaviour setting transformation methodology, filling in the gaps of the conventional architectural design process. *Phil. Trans. R. Soc. B* **379**: 20230292. <https://doi.org/10.1098/rstb.2023.0292>

Abstract

This article recounts 6 years of empirical research in a humanitarian context on spatial behaviour using the behaviour settings theory. This research journey details the shortcomings of conventional architectural processes and the subsequent development of a human-centred behaviour setting methodology that drives behaviour change for adaptable spaces. The research work puts Barker's theory of behaviour settings into practice to show its significant methodological abilities in shaping behaviours through spaces. While the original theory was solely an analytical account of existing behaviours in certain settings, this study marks the first pragmatic exploration of the theory into both residential and refugee contexts. The methodology that is subsequently proposed is a complementary tool to account for the deficiencies of conventional architectural design processes. A method that enables one to fully immerse themselves in the environment, recognize specific architectural interventions, assess their effects and reiterate. It is a proposal for humanizing architecture, sympathizing its processes and personalizing its results for the users of any space.

**This article is part of the theme issue 'People, places, things, and communities: expanding behaviour settings theory in the twenty-first century'.*

Keywords: behaviour settings theory, architecture, conventional design processes, behaviour change, practical method, methodology development



1. Introduction

Behaviour is inherently situated [1], indicating an inseparable connection between behaviour and architecture. The 'behaviour settings theory', introduced by Roger Barker in 1968, adopts a holistic approach by integrating space and behaviour into a unified discourse. Barker defines a behaviour setting as a 'spatial-temporal unit in which a standing pattern of behaviour occurs'. The proposed methodology in this article, referred to as behaviour setting transformation methodology (BSTM), centralizes this standing pattern of behaviour and uses it as a genuine means of understanding space and its users, as well as a tool for reshaping behaviour. The concept of the standing pattern of behaviours, while foundational, does not operate in isolation; instead, it serves as the centrepiece within the broader BSTM framework, infusing architectural design with human-centred principles and incorporating elements from environment-behaviour sciences and psychology. This methodology paper is structured to first highlight the shortcomings of the conventional architectural design process as addressed in the literature. Second, the paper explores the profound connections between the nature of architecture and the original theory of behaviour settings. The subsequent sections present the fieldwork and unfold the proposed methodology (BSTM) in sequential phases, incorporating examples from accomplished experiments that validate the method.

2. Ineffective architecture

A conventional architectural design process typically follows a systematic sequence of stages, allowing architects to develop a coherent and well-structured design. While specific methodologies may vary, a general outline of the conventional design process often starts with the site analysis, which is the time for the architects to assess the project site, considering its physical characteristics, environmental context and surrounding context [2]. After that, the architects work on generating concepts, designing developments and coordinating with other trades and contractors until the project is delivered, at which point the intended user enters the process at the very end.

Architects play a crucial role in the design process. Their professional knowledge is just as crucial as the experiential knowledge of the users, whose day-to-day experiences in their environment provide insights that architects lack. Neglecting this user perspective could significantly impact architectural effectiveness [3]. While one might argue that the site analysis phase allows architects to understand the context and users, the perception remains that architects wield significant control over the process, with their 'professional judgement' exerting sole influence [4]. The process is executed by the architect, assuming the role of the user and evaluating the design's practicality and usability [5]. Through imaginative visualization, the architects test their design ideas from the user's perspective [6]. While the architect is expected to have an empathetic perspective towards the context and the user, their judgements cannot be divorced from their personal socio-cultural context [7].

According to a study on the architectural design process that was published in 2022, there are gaps in the current conventional design process that lead to problematic outcomes when users and their context are not given sufficient attention [5]. The study came to the conclusion that users and context were not given enough weight in existing design models or practical literature. Consequently, this oversight hindered designers and architects from addressing authentic human needs and resulted in the creation of spaces that do not align with users' individual and communal characteristics and social-cultural fabrics.

Despite a consensus regarding the importance of initiating design projects with context and user exploration, it is crucial to highlight that the current availability of truly comprehensive tools and techniques remains limited. The existing tools are inadequate and ill-suited to adequately address the complexity and depth required to encompass the full spectrum of contextual and user considerations. Across the long span of literature, conventional tools have been criticized for their inherent biases, subjective judgements and lack of alignment with reality [8–13].

In essence, the dominant role of architects in conventional design, combined with a reliance on assumptions and imaginative visualizations, challenges the authenticity of data for critical design decisions. This is exemplified through the fieldwork section of this article, §4, which illustrates these shortcomings in practical projects and experiments, highlighting their tangible impact in real-world contexts.

3. Aligning architecture to the behaviour settings theory

Drawing from developments in psychology and the ecological sciences, it becomes evident that humans' behaviour is profoundly influenced by the spaces they inhabit [9,14]. These disciplines reveal that the physical environment significantly shapes individual experiences, emotions and actions. As architects, recognizing this link allows us to create environments that positively influence behaviour and enhance the overall quality of life for users. The behaviour settings theory, a prominent aspect of space-behaviour studies, thoroughly

analyses and discusses this issue, concluding that the content and structure of our psychological world, or life space, are primarily shaped by the occupied behaviour setting rather than individual characteristics [15]. In other words, it altered the discourse from 'I shape my behaviour' to 'the behaviour setting shapes my behaviour'.

Within the realm of human experience, our interactions with diverse environments prompt a continuous transition from one behaviour setting to another. It is crucial to acknowledge that this movement is not merely a matter of choice, as each space inherently encapsulates its own distinct behaviour setting, whether bounded by physical walls or extending into open surroundings. This realisation underscores the pervasive nature of behaviour settings, emphasizing that our engagement with various spaces naturally steers us through a perpetual sequence of behavioural contexts. Scholars in the field of environmental psychology have expounded on the notion that human behaviour is inherently shaped by the transition from one 'behaviour setting' to another, underscoring the influence of environmental cues on these shifts [16,17].

The behaviour settings theory, as traditionally conceived by Roger Barker, is defined as a spatial–temporal unit where a standing pattern of behaviour occurs [15,18]. While Barker and his colleagues conducted extensive observational studies in real-world settings to develop this theory, they primarily rationalized existing behaviour and did not use it as a methodology to promote behaviour change. Allan Wicker, a significant contributor to the theory, expressed in the literature a practical side of the theory, believing that people can change the unsatisfying aspects of their lives by applying changes to the behaviour settings they occupy [19].

The key criteria to identify a behaviour setting are that it has a constantly defined physical space and a standing pattern of behaviour that persists over time, performed by individuals who each play a certain role within a bounded time frame. These behaviours are not isolated incidents but are stable and consistent within the behaviour setting. The behaviours within a behaviour setting are observable and can be systematically studied through direct observation [15]. This criterion emphasizes the empirical nature of the theory.

Robert Sommer, a distinguished environmental psychologist, expanded upon Barker's understanding of behaviour settings and argued for a broader interpretation that includes a wider range of settings beyond those initially outlined by Barker. Sommer's perspective on behaviour settings, which this article also embraces, is more inclusive and expansive compared with Barker's original conception, as he emphasizes the importance of considering any physical environment where human behaviour occurs, ranging from homes and workplaces to public spaces like parks and streets. He emphasized the importance of understanding the relationship between human behaviour and the built environment, arguing that design features and spatial arrangements influence social interactions and individual behaviours within a setting [16].

In an endeavour to streamline the behaviour settings theory and seamlessly incorporate its fundamental elements into the discourse on architecture and architectural design processes, building upon the author's prior research, behaviour settings were defined as a conjunction of a framework composed of four essential components: roles, rules, objects and the design of the space itself [20]. It is the dynamic interplay and chemistry among these elements that shape behaviour. The repetition of such resulting behaviours forms what we term 'standing patterns of behaviour', constituting what we recognize as a behaviour setting.

While the roles represent the assigned positions or functions that individuals play within a behaviour setting, the rules component refers to the normative guidelines, regulations or expectations that govern behaviour and, together with the other components, contribute to the stability of a specific behaviour setting. Both overt and covert rules could reflect societal norms, cultural influences and beliefs or they could be intentionally imposed to practise control over a certain behaviour setting. They serve as mechanisms for maintaining order, guiding behaviour and achieving specific objectives within the defined spatial–temporal unit.

The design of the space pertains to a comprehensive analysis of the physical environment from the perspective of architecture. This encompassing view encompasses factors such as lighting, colour schemes, identification of room functions, evaluation of circulation patterns, movement trajectories and corridors, as well as the meticulous study of ventilation and natural light infiltration within the spaces. Notably, existing furniture and materials also bear relevance to this component, although they are grouped under the objects category. This distinction emphasizes a heightened focus on the direct interplay between objects and how they are used by the occupants within the behaviour setting. Alternatively, it could be viewed as a persistent exploration of how these objects intricately influence the behaviour of their users, perpetuating a deeper understanding of the dynamic interplay between the physical environment and human actions. These four fundamental components, ubiquitously present as we move from one behaviour setting to another, shape individuals' actions and conduct, independent of their personal preferences [15].

Analysing a behaviour setting by dissecting its four primary elements—roles, rules, objects and the design of the space itself (later referred to as 'space')—offers a multitude of advantages and holds significant utility across various contexts. This approach provides a nuanced and comprehensive understanding of the environment and its occupants, yielding insights that can be harnessed for targeted interventions and insightful research.



For those seeking to apply interventions within a specific setting, a thorough analysis of its components becomes paramount. Such an

analysis allows for a deeper grasp of the context and the individuals within it. The cognitive scientist and usability expert Donald Norman highlighted the importance of understanding users' mental models and preferences in the design process [21]. Likewise, the urban theorist Jane Jacobs argues that observing and understanding the needs and behaviours of dwellers are the keys to a functional space [10]. By identifying occupants' distinct needs, diagnosing existing problems or disturbances and promptly locating their sources, practitioners can tailor 'localized and specific' interventions [20,22]. This approach is consistent with the principles of ecological psychology, emphasizing the interplay between individuals and their environment [15].

In another context, as an external observer seeking to understand the behavioural dynamics within a specific environment, analysing a behaviour setting's components holds the potential for predictive accuracy. Through such an analysis, a behavioural prediction accuracy of up to 90% can be achieved, according to the extensive fieldwork observations collected by Roger Barker, the founder of the behaviour settings theory, aiding researchers and analysts in foreseeing the likely behaviours of occupants [23,24]. This predictive prowess enhances research methodologies and augments the credibility of findings.

Addressing the empirical nature of behaviour settings could underscore a tension regarding their ontology—whether they are pre-determined structures or emerging patterns of activities performed by people and materials, and their consequent causal role in behaviour. I believe the two are not necessarily contradictory. Viewing behaviour settings through their methodological potential as a means of shaping and reshaping behaviour, rather than merely as an analytical tool for understanding existing behaviour as Barker originally proposed, suggests a fluidity influenced by the behaviours of individuals and materials within a given space. Crucially, this perspective implies that behaviour settings can be controlled, altered or leveraged to steer behaviour towards desired outcomes.

Conversely, if we approach the concept of behaviour settings primarily as an analytical framework for understanding existing behaviour, we lean towards perceiving them as predetermined structures. This viewpoint emphasizes the stability and predetermined nature of behaviour settings as they exist in a given context.

4. From fieldwork to methodology

The fieldwork was conducted within the residential confines of the Jerash refugee camp in the north of the Kingdom of Jordan. Positioned in the Levant region, Jordan, a nation significantly impacted by migratory movements, has the highest ratio of refugees to the indigenous population of any country [25]. Disseminated between 15 official refugee camps and urban settlements, Jordan is hosting refugees from 57 different nationalities, including the largest number of Palestinian refugees globally [26]. The majority of the Palestinian refugees were given Jordanian nationality except for those who were displaced from the Gaza Strip in 1967 [27] as a consequence of the Israeli invasion and occupation of Palestine [28], and accommodated in Jerash, at what is now known as the Gaza refugee camp. This camp, which was originally prepared to accommodate 11 500 refugees is now hosting more than 40 000 refugees on the same plot since its establishment [29]. Given the protracted refugee situation in the camp, the housing transitioned from tents to primarily cement brick structures, with roofs made of metal corrugated zinc and asbestos sheets laid over steel and wooden bars. The camp nowadays is facing very difficult situations at all levels, while its occupants are considered the poorest among the other refugee camps in Jordan [30].

The initial fieldwork took the shape of a refugee housing rehabilitation project. The selection process involved observing 14 neighbourhoods, encompassing nearly 65 houses, using a structured observation tool. This examination delved into the overall conditions, locations, numbers of residents and their profiles. Because the methodology aimed to explore its validity for targeted behaviours, in the later stages the selection of research participants considered individuals from both the mainstream and extremes concerning specific behaviours. The ongoing 6-year journey of the project, including selection, experimentation, implementation and results analysis, has evolved as it has progressed. Collaborations with the Society for Aid, Improvement, & Bridging (SAIB), a local nonprofit organization and the United Nations Development Programme (UNDP), were crucial for accessibility, legalities and funding. The author played the roles of project manager, lead researcher and architect within a dynamic team of individuals with diverse backgrounds; including architects, designers, engineers, psychologists, humanitarian workers and local committee members, the team saw the overall collective involvement of nearly 70 individuals over the entirety of the project. The UNDP specifically engaged in the final version of the methodology, exploring its effectiveness in reshaping domestic dynamics related to gender roles and norms. This collaboration was instrumental in implementing and advancing the project, yet the author maintained full control and ownership rights over the tested methodology.

a. Tracing the evolutionary journey of BSTM

The development of the BSTM unfolded as a result of shortcomings encountered during the initial phases and progressed through a journey comprising four phases (figure 1). It started with the conventional architectural design process and application, progressed to the integration of human-centred design tools and then encompassed two pivotal phases when BSTM took its initial form as BSTM (A) and finally evolved into its current version, denoted as BSTM (B) at the time of composing this paper. This journey initially involved five housing units for



phases one and two, expanding to 10 housing units in the last two phases. This section will guide you through this developmental trajectory, delineating instances of shortcomings and achievements that resulted in the formation of BSTM.

The motivation for this pragmatic research stemmed from a previous restoration project that faced challenges within a protracted refugee camp. As the project manager and lead architect, I brought expertise from a corporate-style architectural background and a mainstream international architectural education. Consequently, the project strictly followed a conventional architectural design process, where the architect played a central role in all stages of design, development and implementation. As discussed in the previous sections, architects tend to rely solely on their professional knowledge, overlooking the experiential knowledge of users who, I now confidently assert, are the genuine experts, holding insights derived from their daily experiences that only the user, not the architect or any other party, can truly possess.

The main goals of the project were to address the needs of the camp's residents and ensure sustainable dwelling modifications in a protracted refugee camp with uncertain repatriation.

In the usual course of the conventional architectural design process, users have very little say. Despite conducting interviews with the users in the early stages of the project, their involvement comes towards the end of the process, when they have to adjust to all the changes that have been made to the places they are supposed to call 'home'.

It has been demonstrated that the exclusive reliance on interviews with the users and simplistic contextual observations fell short of providing a comprehensive understanding, thereby contributing to the limitations inherent in these conventional methodologies [31–33]. As aptly articulated by anthropologist Margaret Mead, 'What people say, what they do, and what they say they do are entirely different things' [34]. This echoes the phenomenon where individuals may consciously believe they are expressing candour yet unconsciously tailor their responses to meet perceived expectations when facing figures of authority. Such dynamics are particularly pronounced when an asymmetric power relationship is at play.

Conflicts within the design team eventually arose, impeding the project's progress. Disagreements emerged between homeowners. Moreover, the project had the unintended consequence of diminishing the sense of community among those residing in the rehabilitated houses, creating feelings of jealousy and competition in the neighbourhood. Despite the input provided by the house occupants during the initial interview phase wherein they expressed their desired modifications to better cater to their needs, the users felt compelled to make further adjustments to the new designs after the completion of the project in order to better suit their genuine needs.

Examining the reasons behind the issues arising from a humanitarian project aimed at enhancing the lives of challenged refugees prompts us to question two fundamental aspects. First, did we possess the necessary knowledge through compatible means to design effectively for these individuals? Second, how valid was the role we assumed as architects, holding sole authority and control over the entire process? In other words, the positionality of both the architects and users and the lack of genuine knowledge about the behaviour setting and its occupants were the two main problems to pinpoint.

In the endeavour to elevate the project's trajectory, the second phase in the development journey of BSTM involved the integration of human-centred design techniques. Informal open-ended interviews, focus groups with local people, community activities and open-mic sessions are some examples of tools employed to actively involve users in the process. These tools emphasized empathy, collaboration and continual user feedback and enriched the process by prioritizing the needs, experiences and perspectives of end-users. The formation of a local committee at this stage, which worked closely with the team throughout the project's duration, proved extremely beneficial and insightful. Nevertheless, the previously highlighted issues of authority and control in the architect's position persist, remaining the principal and prevailing moderators of the process.

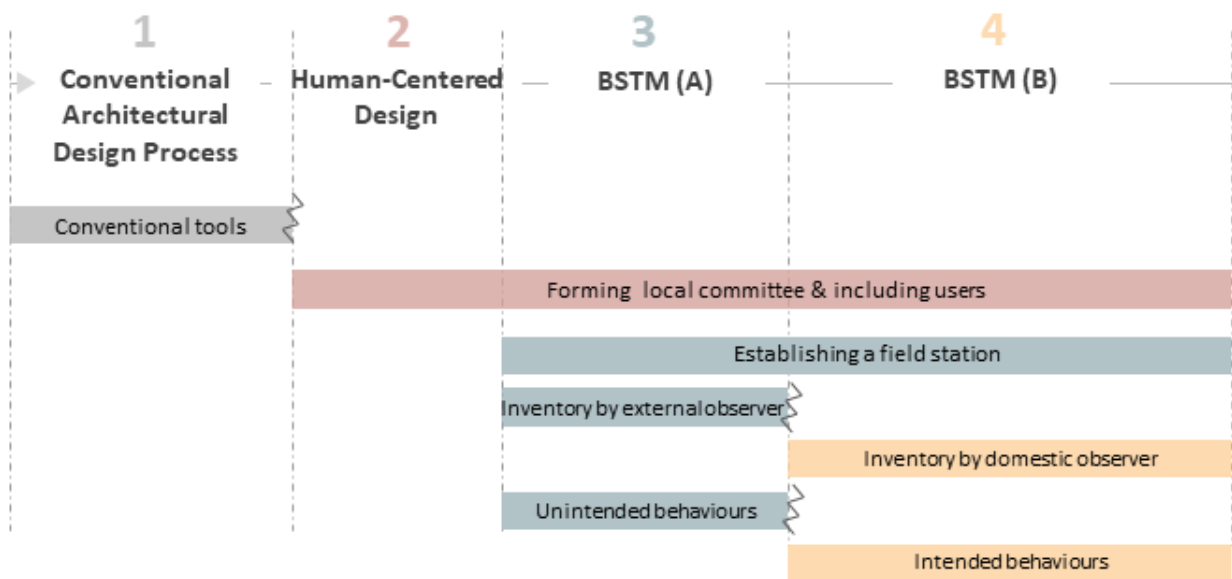


Figure 1. Evolution of BSTM: A four-phase journey from conventional design to human-centred, BSTM (A) to BSTM (B).

In phase three, a field station was established to closely oversee and manage the work. I relocated to the camp with all my tools, cameras, a substantial amount of paper and architectural drawings. Taking this significant step yielded numerous advantages, such as a deeper understanding of the local context, improving data quality and enabling contextualized analysis and ethical considerations. It increased accessibility for data collection, enhanced rapport with the community and facilitated additional collaboration with the local committee members.

Furthermore, two essential steps of BSTM were incorporated into this phase and subsequently refined in the latest version of the methodology based on further explorations and analyses of the collected data. The initial steps necessitate a behavioural inventory that was completed in BSTM (A) either by me or a trained local committee member. The objective of this inventory is to record the standing patterns of behaviour for each individual in the house and arrange them chronologically.

Despite the usefulness of this tool, the data faced inaccuracies when collected by an external observer. In the behaviour setting's perspective, this observer assumes a new role not typically present in the participants' homes, acting as an intervention to the behaviour setting and influencing the standing patterns of behaviour for the rest of the roles. In interviews, participants were noticed inadvertently adjusting their behaviours to align with perceived expectations, especially in the presence of external figures of authority. In essence, family members' behaviours reflected more of what they wished to be seen doing rather than their actual behavioural patterns on a routine basis.

To address these challenges of objectivity and positionality, a domestic peer-to-peer observer replaced the external role in BSTM (B). Family members underwent training for peer-to-peer shadowing, resulting in a significantly higher level of authenticity in the collected data. This increased authenticity seamlessly aligned with the rest of the data, thereby positively influencing the initial objectives focused on achieving a significant behaviour change.

The second improvement from version A to B of the proposed methodology pertains to identifying intended behaviours during the development stage. In BSTM (A), the objectives aimed to test if the methodology would bring about any behaviour change in the standing patterns of behaviour for house dwellers. Although these objectives were successfully achieved, it became evident that the absence of intended behaviours poses challenges in designing specific interventions, hindering the attainment of targeted behavioural change. Therefore, a modification was implemented in BSTM (B) to distinctly articulate intended behaviours as the data type upon which the design decision-making for interventions will be founded. Clarifying intended behaviours facilitates the identification of specific interventions, leading to a targeted and intended behavioural change.

5. Filling in the gaps of conventional architectural design processes: proposing the BSTM

a. An introduction to BSTM

The BSTM is an innovative approach that supplements the conventional architectural design process, infusing it with human-centred principles and customizing its outcomes by incorporating elements from the environment–behaviour sciences and psychology. The methodology strategically harnesses the conceptual framework of the behaviour settings theory, encapsulating its pivotal components—roles, rules, objects and spaces—as integral elements in constructing, understanding and analysing individuals' standing patterns of behaviour within a specific environment. While this establishes a strong foundation for gaining a thorough understanding of the behaviour setting and its users, the subsequent phase focuses on identifying intended behaviours. In comparison to the conventional architectural design process, which typically moves from site analysis to design decisions, BSTM prioritizes identifying intended behaviours, and subsequently, cues are carefully designed to trigger these intended behaviours.

The concept of the standing pattern of behaviours involves neural activity in the brain, particularly its core central part called the basal ganglia, including changes in neural circuitry and synaptic connections [35]. While this connection was not explicitly integrated into Barker's original theory, BSTM's strength and effectiveness are derived from its utilization of these standing patterns of behaviour, which align with the psychological fact that all aspects of our lives are defined by these patterns [36], serving as the fundamental root of our behaviour [37]. This comprehension is highlighted by the fact that behaviour is inherently situated [1], requiring a cue to prompt the brain to enter automatic mode and determine which behavioural pattern to activate. By monitoring these triggers, we can reconfigure behavioural patterns and discourage undesired ones [38]. By leveraging this insight, BSTM's spatial intervention phase involves introducing new cues to disrupt or trigger intended behaviours, thereby facilitating behaviour change. This concept is fundamental to many behaviour change models and therapeutic interventions [39].

However, some confusion may arise regarding the interpretation of behaviour and brain representations, particularly concerning Gibson's ecological psychology. While Gibson initially proposed an anti-representationalist stance in his ecological approach to perception, there has been a shift in interpretation over time, with some contemporary researchers recognizing the role of internal processing mechanisms, including mental representations, in understanding perception [40]. Contemporary followers of Gibson's ecological psychology believe that the information we directly perceive from our surroundings is sufficiently detailed to guide our behaviour, although they acknowledge the involvement of mental processes, considering them to be relatively minimal [41]. This perspective shares common ground with psychologists and neurologists who describe behavioural patterns as habitual and effortless, particularly when the basal ganglia is intact and environmental cues remain constant, resulting in behaviours occurring automatically with modest mental representation [38]. However, it is important to note that this alignment is contingent upon the behaviour already being established as a repetitive pattern. Neurologists identify that once a habit forms, the brain's involvement in decision-making diminishes.

In that context, BSTM's proposal can be positioned as an attempt to bridge perspectives between psychologists, neurologists and contemporary ecological psychologists by concluding that both perspectives can be integrated. This is achieved by denoting that the level of mental processing involved in shaping behaviour is high when encountering new environmental cues, highlighting the collaborative relationship between the brain and the environment (where the environment provides information and the brain interprets it). Conversely, once a repetitive behavioural pattern is established, the mental processing is reduced, with the reliance shifting towards the environmental elements to reproduce the behavioural patterns.

BSTM is structured around a sandwich approach, wherein the development and implementation of interventions (pertaining to architectural aspects) are positioned between two identical analytical behaviour setting tools, both oriented towards a comprehensive understanding of the setting and its inhabitants. The first endeavour aims to learn about existing behaviour patterns, while the subsequent one endeavours to evaluate the behaviours produced and lay the groundwork for iteration when needed (figure 2).



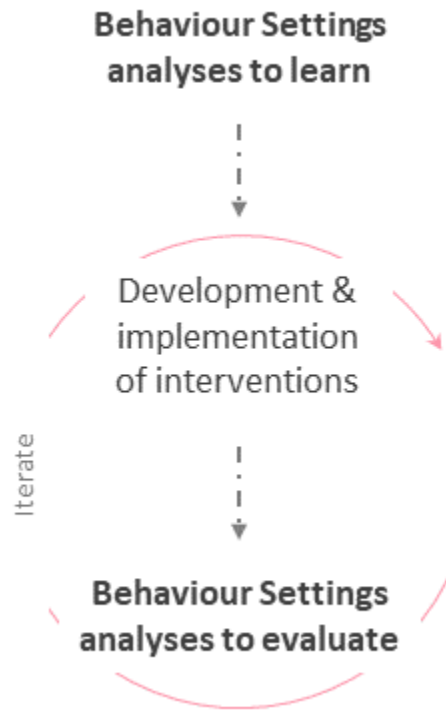


Figure 2. The 'methodological sandwich'—a two-phase approach for architectural intervention and evaluation.

b. Unfolding the BSTM

This section unfolds the methodology through sequential phases, incorporating two selected experiments labelled as House 1 and House 2 for clarity. The examples from these experiments serve as tangible applications of BSTM, offering validation of its efficacy. The example of House 1 illustrates the use of spatial interventions in the behaviour setting to facilitate emotional healing caused by the absence of one of the siblings, who was formerly part of the behaviour setting, owing to a tragic car accident. House 2 showcases interventions designed to alter undesirable gendered behaviours, resulting in a gender-restricted space for the female members of the family. The interventions aim to detach inherited feelings associated with certain spaces and facilitate shifts in the dynamics of gender roles.

BSTM can be delineated into four distinct phases: pre-intervention, development, implementation and post-intervention (figure 3). These phases prioritize the active and full engagement of all parties involved in the interventions, particularly the users.

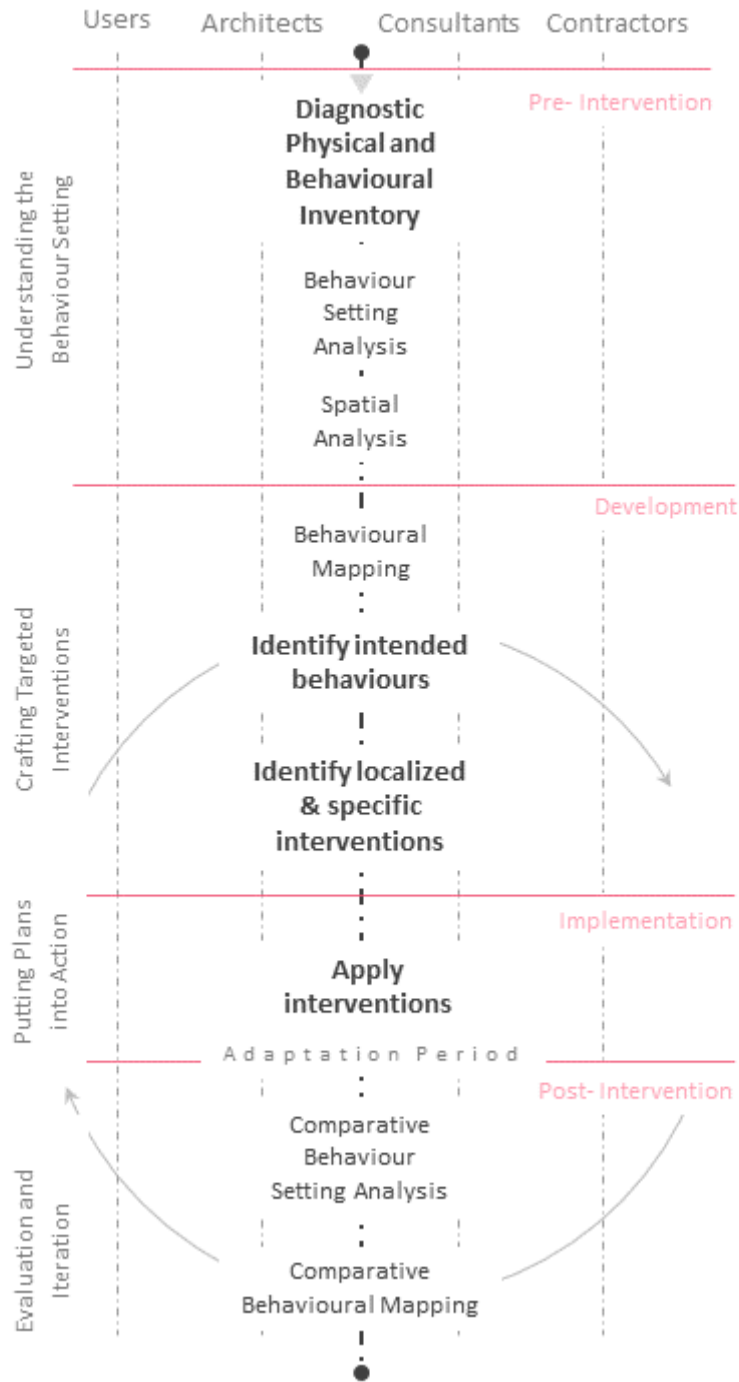


Figure 3. A visual representation of the sequential phases that comprise the BSTM.

i. *The pre-intervention phase: understanding the behaviour setting*

The initial phase involves a systematic examination of the behaviour setting, breaking down its core elements: roles, rules, objects and spaces. The goal here is to gain a deep understanding of the behaviour setting and its occupants. This is achieved by conducting a diagnostic physical and behavioural inventory, which is an adaptation of the behaviour settings survey combined with a spatial analysis of the space and its parameters. During this inventory, a table that lists the standing patterns of behaviour for each role in the behaviour setting is filled out in chronological order (figure 4). The table indicates their role, the beginning and end times of each activity, where they were located while performing that activity (e.g. room title), what objects, tools, furniture, etc. were used to accomplish this activity, and which other roles in the behaviour setting were involved with them. Domestic peer-to-peer shadowing, followed by in-depth discussions, is used to accumulate this data. The discussions delve into the data collected in the behavioural inventory and explore any obstacles or disturbances that arose during the execution of their behavioural patterns. The spatial analyses involve the examination and evaluation of various architectural elements and their interrelationships within a given space, encompassing aspects like layout, design, functionality and the utilization of space.

ii. The development phase: crafting targeted interventions

This phase places emphasis on identifying intended behaviours and subsequently reaching a consensus on spatial interventions designed as cues to prompt these behaviours. It entails introducing interventions into the space component of the behaviour setting to either disrupt or trigger intended behaviours, thereby facilitating behaviour change by reconfiguring behavioural patterns and discouraging undesired ones.

To ensure an effective translation of the data collected in the pre-intervention phase into actionable design elements, the methodology ingeniously employed behavioural mapping. This type of spatial-behavioural illustration facilitates the transition of collected behavioural data through the table shown in figure 4 into architectural language, thereby enhancing the capacity to create spaces that truly resonate with user needs and preferences. As shown in figure 5, this illustration exemplifies the movement patterns of the central figure within the house, identified by larger circles. The surrounding circles depict other participants engaged in the same activity in proximity to the focal point. Comparable mapping has been employed for each observer, providing a comprehensive overview of their respective movement patterns.

MAIN ROLE:Father.....		NAME/CODE:N1H2_1.....				
ACTIVITY/ACTION Involved Behaviour	TIME	INTERACTION with other Roles	SPACE Room	OBJECTS Involved Physical Features	optional PROBLEM Threat on any element of the setting?	optional REASON Source of Threat?
Wake up	7:25	Wife	Bedroom	Foldable Mattresses	High room temperature	Metal ceiling
Tooth brushing	7:30	N/A	Washroom	Water & toothbrush	N/A	N/A
Prepare breakfast	7:40	Daughter 1	Kitchen			
	:					

Figure 4. Exemplifying the behavioural inventory table, showcasing users' daily standing patterns of behaviour, filled out in chronological order for each role separately.

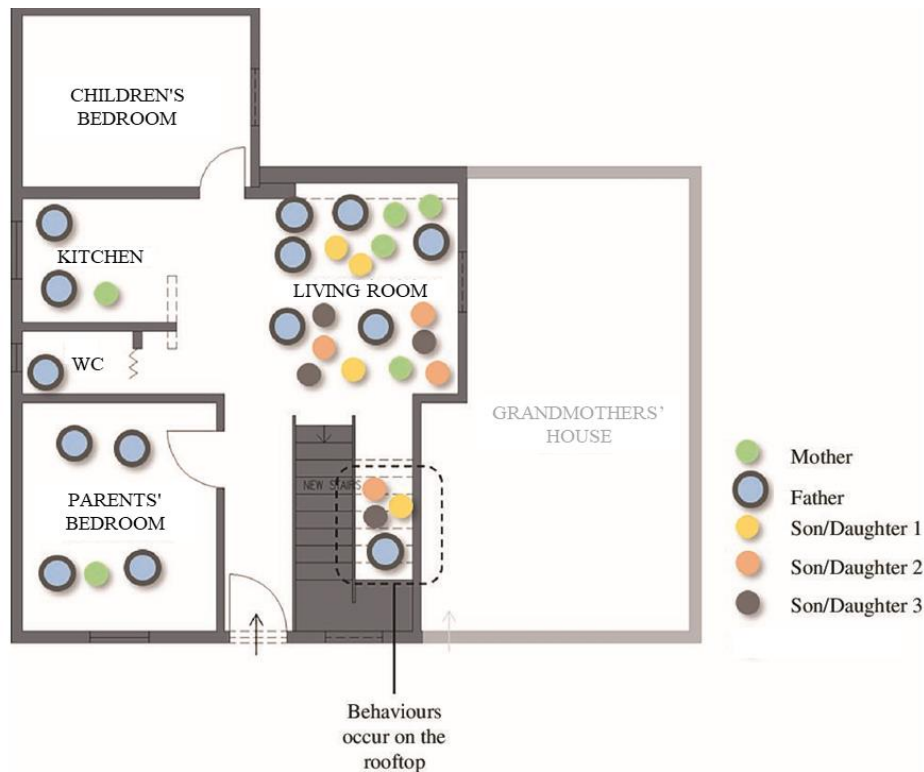


Figure 5. Behavioural map illustrating in-house movement patterns and family member interactions.

Behavioural mapping provides a basis for predicting future user behaviours, enabling the anticipation of potential challenges and the design of interventions, which makes it a perfect match with the Behaviour Settings Theory in its contribution to the behavioural prediction of the users of a certain behaviour setting.

Using behavioural maps in this phase provides a valuable tool to gain insights into user behaviours and preferences, enhancing the effectiveness of the design process and the user experience. It penetrates how individuals interact with and navigate spaces, shedding light on patterns, routines and preferences. Insights from behavioural maps inform design decisions, facilitating the creation of spaces that accommodate users' needs and activities [42]. By identifying high-traffic areas, activity nodes and circulation patterns, architects can optimize the layout for efficient movement and spatial organization [14]. Behavioural maps foster a human-centred design approach, ensuring that the design aligns with user expectations and contributes to user satisfaction [43]. This level of understanding of user behaviours allows for tailoring design solutions that align with specific user requirements, resulting in spaces that are more functional and relevant [20]. Unlike the conventional design process, this approach promotes evidence-based design, as it anchors decision-making in empirical insights rather than relying on assumptions.

Although behavioural maps are occasionally employed in certain architectural design processes, what distinguishes their use in BSTM is the unique approach to data collection and the high degree of accountability associated with the information upon which these behavioural maps are constructed, as explained in the previous phase. Possessing the finest tool or methodology at our disposal is valuable, but using it with inaccurate raw data can render it ineffective and insufficient. By integrating behavioural maps into the design process and deriving their data from the analysis of the four components of behaviour settings, we enable the infusion of behavioural information into the design workflow. The behavioural maps, in conjunction with the diagnostic physical and behavioural observations conducted in phase one, offer a comprehensive range of insights that can be translated into both quantitative and qualitative data. When the behavioural inventory and direct discussions with users do not reveal issues or unmet preferences in the behaviour setting, behavioural maps become invaluable. They offer detailed insights into space utilization, revealing usage patterns and underlying issues, which can be quantified into percentages and numerical figures, facilitating informed decision-making. These data serve as a dependable foundation to move forward with

the next task: identify intended behaviours and make informed decisions about specific spatial interventions that can elicit desired behaviours.

To exemplify the applications of the current and preceding phases, considering the example of House 1, the diagnostic physical and behavioural surveys and the mapping revealed a notable shift in one of the sibling's standing patterns of behaviour, previously taking place in the shared bedroom with his deceased brother. However, the room, laden with memories and emotions of the loss, became an overwhelming space. Consequently, the user's behaviours associated with this particular behaviour setting underwent a significant transformation. The brother, grappling with the emotional weight of the room, was observed physically detaching himself from it. In response, he sought an alternative refuge in the sitting room, attempting to emotionally detach from the bedroom. The inventory indicates discomfort resulting from this behaviour, both for him and other family members, as the living room setting is not conducive to the behaviour performed in it. In other words, the living room space is not designed to function as a bedroom, creating discomfort for its users. Based on this data, an intended behaviour was identified, and accordingly, specific interventions were developed to dissociate the previous feelings and memories of the space from the shared bedroom. The bedroom was relocated and refurbished with a careful selection of design elements not connected to the previous memory of the space.

In the case of House 2, illustrating the experiments, the translation of data from the behavioural inventory into behavioural maps revealed a notable gendered behavioural pattern in the kitchen space. The maps indicated that 97% of the users in the kitchen were female family members. This observation prompted the female family members to acknowledge and express a desire for behavioural change among their male counterparts. The reluctance of male family members to use the kitchen stemmed from culturally inherited feelings of shame, designating it as a gender-exclusive space for females. Consequently, the kitchen space harboured undesired feelings and memories associated with a specific gender. Together with the users, a new design inventory was developed by intersecting two behaviour settings with the intention of changing user behaviour. This transformation connected the gendered kitchen space with the living room, where male family members typically congregate. The design incorporated an open-kitchen layout adjoining the living room, featuring consistent materials and colours in both settings.

iii. The implementation phase: putting plans into action

Once interventions are developed, they are implemented with close monitoring to ensure they align with the intended changes and have the ability to adapt as needed. During this stage, there is a significant opportunity to engage local materials, involve local residents and incorporate local building techniques to the greatest extent possible. This allows for the emergence of innovative and sustainable ideas throughout the process.



iv. *The post-intervention phase: evaluation and iteration*

In the final phase, the behavioural inventory conducted previously is repeated by tracking the standing pattern of behaviours of the occupants, followed by the behavioural maps exactly as were done in the pre-intervention phase. It is possible to conduct comparative analyses to determine the degree to which the interventions had an impact on the targeted behaviours and to make any necessary adjustments is made possible through having data from both the pre- and post-intervention periods.

Since one of the primary objectives of this methodology is the authenticity of the collected data, it is worth mentioning that the field experiments showed that the post-intervention collected data would be more authentic if the occupants were given a considerable period of time to adapt to the new changes and build a standing pattern of behaviour following the implementation of the intervention. Although there is no consensus on the length of this adjustment period in the literature, several researchers—including Heschong [44], Nasar [45], Hartig and Evans [46], Kaplan [47], Gifford [48] and Fylan [49]—have argued that people need an adjustment or adaptation period when they encounter new spaces or experience changes in their environments. The discussions surrounding the development of routines in the realm of psychology and environment–behaviour sciences adhere to the notion that the establishment of routines, or what Barker’s theory refers to as standing patterns of behaviour, necessitates a temporal period marked by both adaptation to the behaviour setting and the repetition of specific actions or activities [15,50,51]. Barker’s notion of the adaptation period is that behaviour stabilizes over time, which requires consistency of repetitive patterns of behaviour in a certain setting. This stability allows individuals to learn and adapt to the expectations and norms of a particular behaviour setting over time. As individuals repeatedly engage in and within the behaviour setting, they become more attuned to its components and the behaviours associated with it.

Regarding the example of House 1, the family member who was initially observed using the living room to engage in behaviours associated with his bedroom underwent a significant transformation in phase 4, conducted 1 year after the application of interventions. Applying comparative behavioural analyses and mapping the collected data revealed that he successfully resituated his behaviour back to the bedroom. The data showed that 100% of the behaviours documented in the living room, when it functioned as a makeshift bedroom, were entirely replicated in the records subsequent to the interventions in the newly designated bedroom. The spatial interventions effectively replaced the space’s old memories with new ones, contributing to a noticeable behaviour change.

In the experiments conducted in House 2 concerning gendered behaviours, within the first year, behavioural inventories and maps revealed the apparent eradication of feelings of shame associated with the kitchen area. The data showed that the open-kitchen layout fostered new behaviours as male members of the family increased their participation in kitchen activities. When the inventory was repeated over a span of 3 years, responsibilities related to the kitchen area demonstrated a nearly equal distribution between male and female family members. In some cases, there was a remarkable increase in their involvement, recording almost 60% participation in activities in the kitchen area, a stark contrast to their complete absence of engagement before the interventions.

6. Conclusion

This article sheds light on the limitations of the commonly employed conventional architectural design process, arguing that it is insufficient. It then proposes a complementary tool using behaviour settings theory, which places greater emphasis on the importance of understanding end-users and the context while also addressing the risks of positionality inherent in the conventional process. By shedding light on the dominant role of architects, it questions the authenticity of contextualizing space and its users. Additionally, it casts doubt on the reliability of data used for critical design decisions, often combined with a reliance on assumptions and imaginative visualizations.

The proposed method, termed BSTM, adapted from the behaviour settings theory breaks down a behaviour setting into four key elements—roles, rules, objects and space—and highlights how these elements collectively shape human behaviour. This approach not only provides a nuanced understanding of environments and occupants but also offers practical tools for its application in multidisciplinary areas, particularly within the realm of architecture.

BSTM emerges as a practical solution to bridge the gaps in conventional architectural design while remaining a work in progress. It offers a structured, four-phase approach that infuses architectural design with human-centred principles and incorporates insights from environment–behaviour sciences and psychology. The proposed methodology centralizes the user’s standing pattern of behaviour and uses it as a genuine means of understanding space and its users, as well as a tool for reshaping behaviour. The evolutionary journey of developing BSTM and its experimentation in highly vulnerable contexts, such as protracted refugee camps, highlights the adaptability and potential impact of the methodology. It showcases its validity in healing trauma, shifting gender roles and norms and detaching previous memories and feelings associated with spaces.

Meanwhile, questions still linger regarding its applicability in the context of large-scale projects with a substantial number of inhabitants and its suitability for entirely new projects on vacant land. The challenge lies in how to effectively implement this methodology when dealing with a sizeable population, as selecting samples and generalizing results could undermine the methodology’s core principle of tailoring

specific and localized interventions to meet users' unique needs and behaviours.

Barker's original theory posits that behaviour settings tend to exhibit stability over time, maintaining consistent patterns of behaviour and interaction. Practical utilization of this theory, such as conducting behaviour setting surveys and applying it to the field of architecture and the built environment, necessitates the existence of pre-established behaviour settings. This stability enables individuals to acclimate and adjust to the expectations and norms specific to a given setting as they repeatedly engage in behaviours within it. Consequently, this highlights a limitation shared with the proposed methodology in this article, which mirrors the inherent constraint of the behaviour settings theory itself. That is, the theory's parameters are most applicable to behaviour settings that already exist and may not readily extend to spaces in uninhabited areas or entirely new projects.

It is worth noting that the proposed method primarily targets the reconstruction, renovation or rehabilitation of existing built environments. This adaptability underscores the methodology's potential to address a wide spectrum of real-world challenges. BSTM's main concepts could be adapted to play a pivotal role in the rehabilitation of refugee spaces, aiding the urban development of inhabited cities, preserving the cultural and religious significance of sites, supporting natural disaster recovery efforts and enhancing healthcare facilities.

In essence, this article underscores the importance of going beyond conventional methodologies and embracing a more user-centred and context-aware approach. It encourages architects, designers and those who work in the fields of psychology and behaviour sciences to consider the influence of behaviour settings on human experiences and actions and to explore innovative methodologies like BSTM to create spaces that truly resonate with their users, spaces that align with their values, needs and preferences. Spaces that evoke a sense of connection and belonging, comfort and understanding, making them feel relevant, relatable and meaningful.

REFERENCES

1. Gibson, J.J. 2015. *The Ecological Approach to Visual Perception, Classic Editions*. Hove, East Sussex: Psychology Press. (doi:10.4324/9781315740218)
2. Ballast, D.K. 2009. *Architect's Handbook of Construction Detailing*, 2nd ed. Hoboken, NJ: John Wiley & Sons. (doi:10.1002/9781118260227)
3. Day, C., & Parnell, R. 2003. *Consensus Design: Socially Inclusive Process*. Oxford, UK: Oxford Architectural Press.
4. Lawson, B. 2010. *How Designers Think: The Design Process Demystified*, Reprint. Amsterdam, The Netherlands: Elsevier Architectural Press.
5. Hettithanthri, U., Hansen, P., & Munasinghe, H. 2023. Exploring the architectural design process assisted in conventional design studio: a systematic literature review. *International Journal of Technology and Design Education*, 33, 1835–1859. (doi:10.1007/s10798-022-09792-9)
6. Pallasmaa, J. 2014. Empathic imagination: formal and experiential projection. *Architectural Design*, 84, 80–85. (doi:10.1002/ad.1812)
7. Önal, G.K., & Turgut, H. 2017. Cultural schema and design activity in an architectural design studio. *Frontiers of Architectural Research*, 6, 183–203. (doi:10.1016/j.foar.2017.02.006)
8. Le Corbusier. 1967. *The Radiant City: Elements of a Doctrine of Urbanism to be Used as the Basis of our Machine-Age Civilization*. New York, NY: Orion Press.
9. Alexander, C., Ishikawa, S., & Silverstein, M. 1977. *A Pattern Language: Towns, Buildings, Construction*. New York, NY: Oxford University Press.
10. Jacobs, J. 1992. *The Death and Life of Great American Cities*. New York, NY: Vintage Books.
11. Sassen, S. 2001. *The Global City: New York, London, Tokyo*, 2nd edn. Princeton, NJ: Princeton University Press. (doi:10.1515/9781400847488)
12. Hayden, D. 2002. *Redesigning the American Dream: The Future of Housing, Work, and Family Life*, Revised and expanded. New York, NY: W.W. Norton.
13. Jodidio, P. 2009. *Hadid: Zaha Hadid Complete Works 1979–2009*. Köln, Germany: Taschen.
14. Lynch, K. 1960. *The Image of the City*. Cambridge, MA: The MIT Press.
15. Barker, R. 1968. *Ecological Psychology: Concepts and Methods for Studying the Environment of Human Behavior*. Stanford, CA: Stanford University Press.
16. Sommer, R. 1969. *Personal Space: The Behavioral Basis of Design*. Englewood Cliffs, NJ: Prentice Hall.
17. Hall, E.T. 1990. *The Hidden Dimension*. New York, NY: Anchor Books.
18. Barker, R.G., & Wright, H.F. 1951. *One Boy's Day: A Specimen Record of Behavior*. Oxford, UK: Harper.
19. Wicker, A.W. 2002. Ecological psychology: historical contexts, current conception, prospective directions. In *Meeting of the German Congress for Environmental Psychology*, September 1999. Magdeburg, Germany: John Wiley & Sons, Inc.
20. Awamleh, Z., & Hasirci, D. 2022. A multi-method behavior setting analysis of a protracted refugee camp in Jordan. *Environment and Behavior*, 54, 783–808. (doi:10.1177/00139165221084726)
21. Norman, D.A. 2008. *The Design of Everyday Things*, First basic paperback. New York, NY: Basic Books.
22. Newman, O. 1978. *Defensible Space: Crime Prevention Through Urban Design*. New York, NY: Collier Books.

23. Heft, H. 1988. Affordances of children's environments: a functional approach to environmental description. *Children's Environments Quarterly*, 5, 29–37. <http://www.jstor.org/stable/41514683>
24. Curtis, V. 2015. Who's in control: the power of settings | Val Curtis | TEDxLSHTM - YouTube. See <https://www.youtube.com/watch?v=xuJY5A5gOS4>.
25. Chatelard, G. 2010. Jordan: a refugee haven. *Migration Policy Institute Online Journal*. halshs00514403f. <https://shs.hal.science/halshs-00514403/document>
26. Awamleh, Z., & Dorai, K. 2023. The spatial governance of the Syrian refugee crisis in Jordan: refugees between urban settlements and encampment policies. *C.M.I. Report*, 3. See <https://www.cmi.no/publications/8909-the-spatial-governance-of-the-syrian-refugee-crisis-in-jordan>.
27. El-Abed, O. 2021. The invisible citizens of Jordan. In *Minorities and State-Building in the Middle East* (eds P. Maggiolini, I. Ouahes), pp. 111–129. Cham, Switzerland: Palgrave Macmillan. (doi:10.1007/978-3-030-54399-0)
28. Quigley, J. 2023. Israel's unlawful 1967 invasion of Palestine. In *Prolonged Occupation and International Law: Israel and Palestine* (eds N. Kiswanson, S. Power), pp. 13–30, vol. 66. Leiden, The Netherlands: Koninklijke Brill NV. (doi:10.1163/9789004503939)
29. Anera. 2019. What are Palestinian refugee camp conditions like? *American Near East Refugee Aid*. See <https://www.anera.org/blog/what-are-palestinian-refugee-camp-conditions-like>.
30. Tiltnes, Å.A., & Zhang, H. 2013. Progress, challenges, diversity: insights into the socio-economic conditions of Palestinian refugees in Jordan. See <https://www.faf.no/en/publications/faf-reports/progress-challenges-diversity>.
31. Patton, M.Q. 2015. *Qualitative Research & Evaluation Methods: Integrating Theory and Practice*, Fourth edition. Los Angeles, CA: Sage Publications.
32. Creswell, J.W., & Plano Clark, V.L. 2018. *Designing and Conducting Mixed Methods Research*, Third Edition. Los Angeles, CA: SAGE.
33. Denzin, N.K., & Lincoln, Y.S. (eds). 2018. *The SAGE Handbook of Qualitative Research*, Fifth edition. Los Angeles, CA: SAGE.
34. Ewing, S. (ed). 2011. *Architecture and Field/Work*. Milton Park, UK: Routledge. (doi:10.4324/9780203839447)
35. Graybiel, A.M. 2008. Habits, rituals, and the evaluative brain. *Annual Review of Neuroscience*, 31, 359–387. (doi:10.1146/annurev.neuro.29.051605.112851)
36. James, W. 1890. *The Principles of Psychology*, vol. I. New York, NY: Henry Holt and Co.
37. Dean, J. 2013. *Making Habits, Breaking Habits: Why We Do Things, Why We Don't, and How to Make Any Change Stick*. Boston, MA: Da Capo Lifelong.
38. Duhigg, C. 2013. *The Power of Habit: Why We Do What We Do and How to Change*. New York, NY: Random House Books.
39. Skinner, B.F. 1969. *Contingencies of Reinforcement: A Theoretical Analysis*. Englewood Cliffs, NJ: Prentice-Hall (The Century Psychology Series).
40. Hill, C.S. 2022. *Perceptual Experience*, 1st edn. Oxford, UK: Oxford University Press. (doi:10.1093/oso/9780192867766.001.0001)
41. Warren, W.H. 2021. Information is where you find it: perception as an ecologically well-posed problem. *i-Perception*, 12, 20416695211000366. (doi:10.1177/20416695211000366)
42. Wang, D., & Groat, L.N. 2013. *Architectural Research Methods*, Second Edition. Hoboken, NJ: Wiley.

43. Zeisel, J. 2006. *Inquiry by Design: Environment, Behavior, Neuroscience in Architecture, Interiors, Landscape, and Planning*, Rev. ed. New York, NY: Norton.
44. Heschong, L. 1979. *Thermal Delight in Architecture*. Cambridge, MA: MIT Press.
45. Nasar, J.L. (ed). 1992. *Environmental Aesthetics: Theory, Research, and Applications*, First paperback ed. Cambridge, UK: Cambridge University Press.
46. Hartig, T., & Evans, G.W. 1993. Psychological foundations of nature experience. In *Behavior and Environment: Psychological and Geographical Approaches* (eds T. Gärling, R.G. Golledge), pp. 427–457, vol. 96. North-Holland: Elsevier. (doi:10.1016/S0166-4115(08)60053-9)
47. Kaplan, S. 1995. The restorative benefits of nature: toward an integrative framework. *Journal of Environmental Psychology*, 15, 169–182. (doi:10.1016/0272-4944(95)90001-2)
48. Gifford, R. 2014. *Environmental Psychology: Principles and Practice*, 5th edition. Colville, WA: Optimal Books.
49. Fylan, F. 2023. *Lecture: Ten Things I've Done for Money (and Not Regretted)*. Leeds, UK: Leeds Beckett University.
50. Wicker, A.W. 1979. *An Introduction to Ecological Psychology*. Monterey, CA: Brooks/Cole Pub. Co.
51. Gardner, B., Lally, P., & Wardle, J. 2012. Making health habitual: the psychology of “habit-formation” and general practice. *British Journal of General Practice*, 62, 664–666.