How does visual connection to the urban city environment, viewed from domestic high-rise floor-to-ceiling windows, influence the users' perceived desirability of the interior space?

Critical Design Research

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Abstract

Intrigued by the significant effect an exterior view (which is perceived as crucial in the high-rise interior experience) has on user viewing experience, this research aimed to explore how visual connection to the urban environment, viewed from a high-rise environment, affects the perception of the interior space itself. Previous research indicates user preference towards natural views (Abh-Alhamid, Kent and Wu, 2023) with the perception of subjective beauty reliant on personal experience and beliefs (Lupyan, 2017). The aspect of privacy and safety, via the prospect-refuge theory is crucial to influencing user comfortability in spaces, due to evolutionary development (Hwang and Lee, 2018).

Highlighting the importance of an interior designer's role within the overall design process (from conceptual development to realisation), this research also wished to explore how the positive

user experience of a high-rise interior may be enhanced through the relationship between the exterior and interior space, curated by the interior designer.

Results from primary data collection determined user preference towards window view access within an interior space, due to the resulting feeling of serenity, which connection to nature could provide. Furthermore, participants positively received natural exterior conditions, with urban exterior environments providing a negative/neutral one. The quality of the sky was found crucial in affecting the perception of the interior vibrancy and brightness, consequently affecting semantic interpretation of the space and key elements (furniture and colour). Finally, the prospect-refuge theory (Hwang & Lee, 2018) was found to be prevalent in determining perceived user safety and desirability of the space, ultimately affecting users' economic commitment to chosen interior space.

Aims and Objectives

AIM: To explore how visual connection to the urban city environment, viewed from domestic high-rise floor-to-ceiling windows, influences the users' perceived desirability of the interior space.

SECONDARY OBJECTIVES	• To identify what defines ***an urban city environment*** from a higher elevation, through using secondary research in the literature review. • Understand the ***logistics of human sight, human perception,*** and its ***psychological implications***. • Explore the ***key factors and aspects of what*** constitutes an effective/successful design of the interior through the ***perspective of aesthetic beauty and desirability.*** • Identify specific ***design styles/aesthetics*** which are used in high-rise domestic interiors. • Research into the idea of the ***domestic interior*** and the significance of ***user personalisation*** in said spaces.
PRIMARY OBJECTIVES	• To gather and analyse users' preference, towards visual stimulus/simulation in the form of a ***questionnaire-scoping study.***

	• To explore how the relationship between the perception of the interior and the external view is affected by an urbanised or more natural environment, using a ***controlled laboratory experiment***. • To gain further qualitative insight into the relationship between the user's perception of a space, through participant experience, focusing on perceived desirability and safety, through ***semi-structured interviews***.
TERTIARY OBJECTIVE	To combine results from both the primary and secondary objectives, to establish rationalised conclusion(s), regarding the aim of the design research.

Table 1 Detailed Objectives (Primary, Secondary, Tertiary) to help resolve the research aim

Literature Review

Urban City Environment

Conducting an extensive literature review (refer to Appendices 1), research indicated that designing *for* nature proved influential on psychological restoration and positive affect, with larger proportions of green cover contributing to more positive emotional states (Olszewska-Guizzo et al., 2018). These findings clearly distinguish the link between nature and human emotion; one may question if viewer experience is significantly affected. Could user emotional bias and judgement of their physical spatial context be influenced due to positive psychological affect? Finally, how could this affect marketability and economical potential of a space, towards potential buyers?

Logistics of human sight, perception, and psychological implications

High-information content views were the most influential in affecting user preference towards certain views (Abd-Alhamid, Kent and Wu, 2023) . Though views of nature were processed more fluidly, likely due to an innate evolutionary preference (Rathmann et al., 2022), and its ability in reducing user annoyance (Abd-Alhamid, Kent and Wu, 2023), the fulfilment of certain criteria (see Table 2 below), determined preference.

Criteria of high-information content views:	How does it affect the user
• Access to environmental information • Sensory change to the interior space. • Connection to the world outside. • Provision of user restoration and recovery.	• Crucial to user psychological and physiological wellbeing.

Table 2 Specific criteria determining user view preference, according to Abd-Alhamid, Kent and Wu (2023)

Using these criteria in thematic analysis after primary data collection, could help identify appropriate patterns, leading to rationalised conclusions for the research objectives and aim. Furthermore, the difference between an urbanised and more natural environment's effect on user experience and perception of the interior space can be explored.

Visual privacy could prove significant to user experience and perception of safety within a space. Visual privacy (referring to the factor of visual distance between elements) was most perverted in the middle floors of a building (Zheng et al., 2021). Consequently, this highlights how visual privacy and height elevation is not guaranteed. Could a view lacking visual privacy reduce user comfort and perceived safety, due to an innate desire for protection against visual/physical exposure (Rathmann et al., 2022)? How do different factors, in an urbanised and natural environment, affect visual privacy? These are aspects worth exploring.

Raftopoulos and Lupyan (2018) explain what an individual chooses to "attend" to cognitively, can influence perceptual experience. "Attending" is a complex cognitive process, in which one's learned object knowledge is incorporated, and can highly influence objective performance and subjective perception (Lupyan, 2017). This highlights the importance individual factors have on subjective viewing experience and leads to the justification of using a scoping study of participants in primary methodology: factors related to participants' previous experiences with the research variables can be determined, and extraneous variables (EVs) could be controlled.

Lupyan (2017) determined that attending can enhance an object's perceived physical attributes. Overall, it was found attending vastly affects perceptual processing. Understanding which tangible

factors of perception can be affected, the researcher can focus on analysing these to determine if/how perceptual relation between high-rise views and interior space occurs.

The Interior Design of high-rise domestic interiors

Using a Dezeen.com article (Singh, 2023), the researcher identified intentional design choices used to emphasise the relationship between the interior, the exterior, and the user. The main living area, furnished with rounded, soft furnishings, increases feelings of balance and unification (Al-Zamil, 2017), combatting possible negative visceral reactions (Norman, 2005) resulting from large open windows reducing feelings of safety (Minarovičá, 2016). Furthermore, the identity of the surrounding location is infused into the whole design, through the use of colours and surfaces. This identifies a key trend in high-rise interior design: moving towards highlighting the connection between the interior and exterior environment, using architectural design and intentional aesthetic design choices: the interior designer plays an invaluable role in influencing users' psychological comfortability and perception.

A neurological response, when an action is completed by the individual or another agent, involves the mirror-neuron system (Chatterjee and Vartanian, 2016). They further explain how empathetic responses engage one's emotional circuitry, and mirror emotions portrayed in the artwork itself. This is intriguing, as interior design often lacks explicit subject matter showcasing human emotion and experience like traditional art: how do interior designers convey and evoke emotion in their designs, and what subject matter is most relevant in an interior space, regarding user experience? Through interviewing participants, the researcher hopes to resolve such queries.

Hendy (2021), explains how subjective beauty of a space depends on agreeance with the user's psychological states and beliefs/associations, making it harder to objectively determine beauty and ugliness. This highlights the importance of a scoping study before any further experimentation is to take place in the research: general participant themes of like and dislike can be identified to help inform the choice of interior elements/composition.

Hwang and Lee (2018) explain the human preference to remain in spaces where one can assess and view their surroundings, without perception from the exterior, as the prospect-refuge theory. The conditions of prospect-refuge are split in two: the outdoor environment (natural factors and external surroundings) and the built environment (building design choices). Splitting the design of the interior space into these two main sections can help in analysing primary data, providing clear direction of variables, which the researcher could change and test.

Though windows act as physical protection and allow visual connection to the exterior, Minarovičá (2016) warns against using too much glass as higher exposure reduces feelings of safety and refuge. This is crucial when designing visualisations for primary research: there must be a good level of exposure to ensure a reaction of danger/lack of security is not evoked.

The role of the user is considered in an article by Bettaieb & Alawad (2018). They describe how the user represents the moral and physical (human) element within a space, through a reciprocal relationship between themselves and their environment. This idea is crucial in fulfilling the aim of the research, as it supports the idea in which there is an interactional relationship between the interior space and the human within it.

Primary experimentation

Ethical considerations

Before any primary experimentation was completed, the researcher obtained ethical clearance from the ethical board of Southampton Solent University (refer to Appendices 2). Participants were all briefed of the intention and requirements of the research and informed on the use of their data collected in the research. As the same participant cohort was used throughout the primary data collection, all participants were asked to read the participant information sheet (refer to Appendices 3) and give their informed consent (refer to Appendices 4) to use their data in this academic paper, before completing the first methodology.

Methodology 1 – Online Questionnaire/Scoping Study

Preparation

Reviewing the extensive literature review, specific areas of interests, were identified. These interests were then allocated to each methodology, according to which one would seem most appropriate in resolving each interest (refer to Appendices 5). The overall primary data collection process was then clarified (refer to Appendices 6).

For the online questionnaire, the most appropriate themes to be explored, were identified, from which questions were established (refer to Appendices 7), ensuring that participant and researcher objectivity was maintained. Certain questions were refined to be more detailed, focused, and appropriate for the questionnaire. These were then piloted, addressed to resolve any clarification issues (wording) and solidify intentions (refer to Appendices 8), then used in the final online questionnaire (refer to Appendices 9).

Results

Collected from 42 participants (17 designers and 25 non-designers), the results gathered (refer to Appendices 10) affirmed research mentioned in the literature review, as well as uncover findings, which would benefit from further exploration.

Supporting research by Abd-Alhamid, Kent and Wu (2023), 78.5% of participants described the presence of an outside view as *very/extremely important*. Though this could have been due to a preference for visual connection to the exterior environment, the most prevalent reason was due to the ability to view nature from the space (see Figure 1 below). The most common reasoning

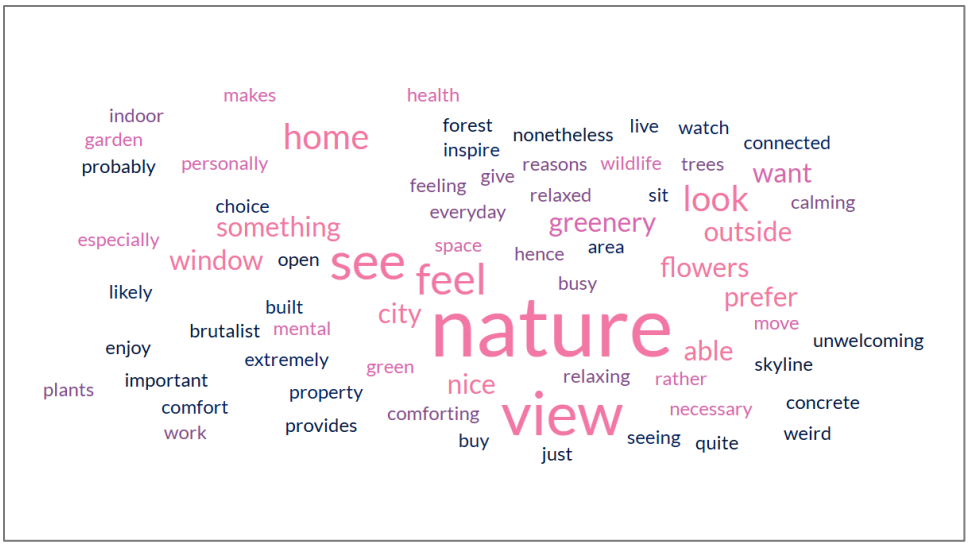


Figure 1 Wordcloud showcasing the most frequent words in participants' answers, explaining their preference towards access to a window view

was the possible serenity that a natural view could provide. Consequently, this fulfils part of the criteria determining user view preference (Abd-Alhamid, Kent and Wu, 2023): the desire for user restoration and recovery.

Curious about the mirror-neuron system, described by Chatterjee and Vartanian (2016), and its translation into the realm of interiors, a multitude of physical design elements were mentioned by participants, when asked about what they notice upon entering a room. The most common element was *Furniture*, then followed by *Windows*. Not only does this support the significance of a window within an interior space, regarding user preference, but also affirms the importance of effective visual communication, of the designer. As these elements are reliant on sight, it suggests the choice of style, size and colour of the furnishings are crucial in communicating intended emotion to the user: though there is not a clear emotional agent to reflect the mirror-neuron system (Chatterjee and Vartanian, 2016), furniture can be used to evoke positive emotions of desirability (coziness, comfort, warmth, etc…).

Perhaps, the most interesting finding was in participants' likes and dislikes of certain visualisations of high-rise apartments. Despite having different personal preference and dislike towards certain images shown, there were clear commonalities in what they would associate with a desirable and undesirable (interior) design. Their positive perceptions of a space were due to its ability to provide a sense of warmth and coziness, and being inviting, spacious and clean (see Figure 2 below).

Likewise, the same pattern was found in their responses explaining their dislike towards a space (see Figure 3 below), describing how they least preferred the space which gave a cold, empty and bland or boring impression. This consequently could further support Hendy's (2021) research, in which he describes desirability and beauty as an agreeance with the person's psychological state and beliefs in a specific moment: this individually manifests into different subjective preferences, connected through the commonality of positive emotions evoked in the user.

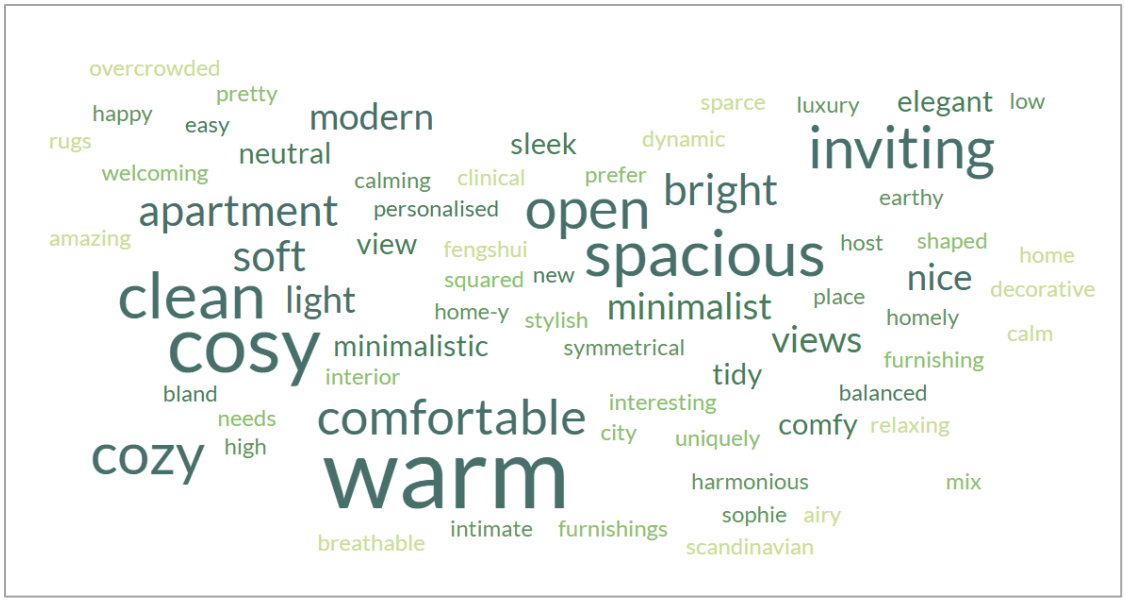


Figure 2 Wordcloud showcasing the most frequent words in participants' answers, describing their likes towards their preferred space

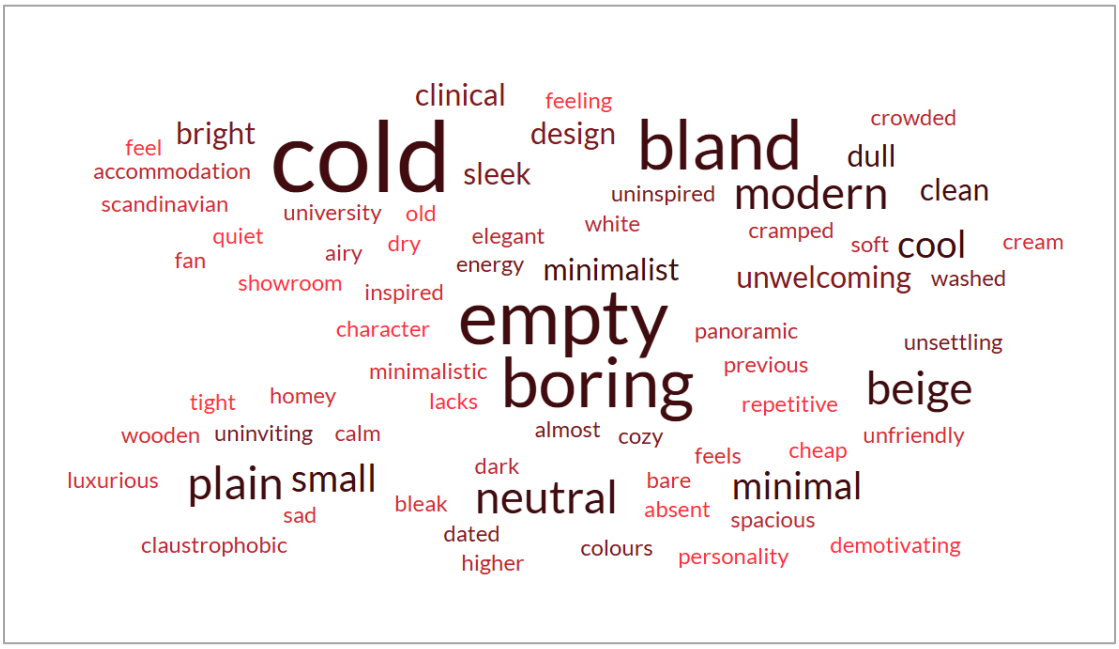


Figure 3 Wordcloud showcasing the most frequent words in participants' answers, describing their dislikes towards their least preferred space

Supporting the findings regarding the focal point in an interior space, the reasoning behind their preferences suggested a highly personal and emotional response as consequence of the spatial decisions (cramped, empty, or balanced) of the furniture and the use of colours to create an atmosphere. This highlights the importance of furniture, specifically the overall colour palettes created, in conjunction with the spatial relations between elements, and its influence towards user likes and dislikes.

Methodology 2 – Lab Experiment

Preparation

Using the idea of the prospect-refuge theory (Hwang & Lee, 2018), the visualisations produced in this experimentation were prepared according to the built and outdoor environment, to clarify and refine aspects to be altered. In this context, the outdoor environment refers to the altered views (see Table 3 below) whilst the built environment refers to the interior visualisation (see Figure 5 below) developed and refined from the scoping study, performed in the first stage of primary data collection.

Visiting 22 Bishopsgate in London, the researcher decided to use images captured at the site. Using one main image, the view faces the southwest of London, including iconic monuments that are easily recognisable.

Adobe Photoshop was used to accordingly this image to produce four view conditions:

Urban Open (Southwest London)	Adjustments (Adobe Photoshop)	Reason for use
	• Vibrancy to -100 • Maintained original grey sky	The lack of saturation and higher proportion of grey emphasises the built urbanised environment.
Natural Open (Southwest London)		
	• Vibrancy to +100 • Used Adobe Generative AI fill to create blue sky and insert green spaces/natural elements.	Increasing the vibrancy highlights green cover, and the blue sky emphasises the natural elements present.

Urban Enclosed (Southwest London)	Adjustments (Adobe Photoshop)	Reason for use
	• Vibrancy to -100 • Maintained original grey sky • Used Adobe Generative AI fill to insert skyscrapers.	The skyscrapers act as visual obstacles, providing a more obvious difference between images.
Natural Enclosed (Southwest London)		

	• Vibrancy to +100 • Used Adobe Generative AI fill to create blue sky, insert green spaces/natural elements, and skyscrapers.	The skyscrapers act as visual obstacles, providing a more obvious difference between images.

Table 3 Digitally altered exterior visualisation to fit four different view variations (Urban/Natural; Open/Unclosed) used in the Laboratory Experiment

Regarding the interior space itself, a simple seating area floorplan, for a living room, was created on Vectorworks 2024 (see Figure 4 below). After analysing general likes and dislikes from the scoping study (online questionnaire), the interior space was then furnished in accordance with these findings, keeping to the same floorplan. It was then rendered in the 3D rendering system of TwinMotion, to better resemble a realistic looking interior space, intending to contribute to external validity (see Figure 5 below).

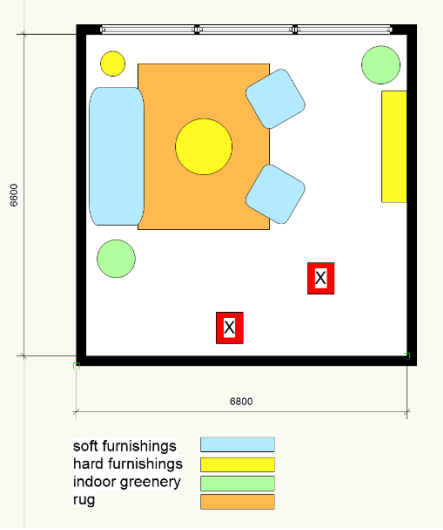


Figure 8 Floorplan template created in Vectorworks 2024, helping to inform furniture placement

Figure 6 3D rendered visualisation of the interior space, including furnishings in accordance with participant likes determined from the online scoping study (online questionnaire)

Seeming insufficient to simply put visualisations, to fulfil the primary objective "*To explore how the relationship between the perception of the interior and the external view is affected by an urbanised or more natural environment, using a* ***controlled laboratory experiment,"*** questions were attached to each view to help gain participant insight (see Table 4 below).

The interior visualisation was then combined with the altered views, and placed into a JISC survey, in which the study was piloted (refer to Appendices 11). Following this process, slight changes to the *Natural Enclosed* condition were completed.

Name	Image Visualisation	Additional Questions
Urban Open		Did the view affect the way you feel about the space? Was it positive or negative? What visual stimulus did you focus on in the interior? What visual stimulus did you focus on in the exterior?
Natural Open		Did the view affect the way you feel about the space? Was it positive or negative? What visual stimulus did you focus on in the interior? What visual stimulus did you focus on in the exterior?
Urban Enclosed		Did the view affect the way you feel about the space? Was it positive or negative? What visual stimulus did you focus on in the interior? What visual stimulus did you focus on in the exterior?

		Did you find the external buildings acted as visual obstacles in the view? On a scale from 0 to 10, how much did they affect the view for you?
Natural Enclosed		Did the view affect the way you feel about the space? Was it positive or negative? What visual stimulus did you focus on in the interior? What visual stimulus did you focus on in the exterior? Did you find the external buildings acted as visual obstacles in the view? On a scale from 0 to 10, how much did they affect the view for you?
Further Questions		Would you feel visually exposed to the exterior environment with any of the views shown? If you chose "Yes" which one?

Table 4 Four different visualisation conditions used in the Laboratory Experiment, with intended questions to be answered in conjunction

Results

Using Hwang & Lee's distinction between the outdoor and built environment, the results from the participants proved interesting, regarding the difference between a more urban/natural and open/enclosed external view (outdoor environment). For the majority, all four conditions affected participants' opinion towards the space. Both open views (urban and natural) affected all participants' opinion towards the space, with the enclosed conditions introducing difference amongst results (66.67% agreed in a change of opinion). This partially supports the hypothesis, in which the view in a high-rise interior space does influence subjective participant experience.

However, regarding desirability and positive experience, the further results help to solidify conclusions: the natural conditions produced an overall positive response, with the urban conditions conclusively producing negative and neutral responses. *Natural Open* produced the

most positive response, with 66.7% of participants describing the view as having a positive effect on their opinion; *Natural Enclosed* produced an even proportion between positive and neutral effect of participant opinion. Finally, both urban conditions had no positive responses, with even proportions (respectively) of negative and neutral effects on participant opinion. There is conclusive dislike towards urban views, regarding the context of placing it within a luxurious interior space, thus supporting Rathmann et al.'s (2022) research of evolutionary tendency and preference towards a natural environment.

Supporting findings from Methodology 1, participants reaffirmed that user attention focuses on interior furniture and colour. Despite maintaining the same interior visualisation for all four conditions, the two *Open* conditions produced a difference in perception of light and its effect in the interior space. For example, some participants described their focus, in each respective *Open* condition, being the brightness of the interior space in the *Natural Open condition,* and the shadows/lack of lighting in the *Urban Open* one. This is significant, as it highlights how the view conditions, alone, can emphasise specific aspects of the interior: interior designers can utilise this to emphasise interior elements which can help to create connection and cohesion between the interior and exterior environment (following the trend seen in high-rise interiors).

As expected, the skyscrapers were described as key focal points in the *Enclosed* conditions, with a similar proportion (50% & 66.67% respectively) of participants perceiving them to be visual obstacles in both the *Natural* and *Urban* conditions. While this result demonstrates the influence other external skyscrapers have on user viewing experience, the most interesting result comes from the Lickert Scale results, in which participants were asked to rank how much each respective view affected them (on a scale of 1-10): 1 being *not at all,* 10 being *extremely.* The *Urban Enclosed* condition produced a wider range of result values (8) and less frequency of individual ratings, whereas the *Natural Enclosed* condition produced a more concise range of result values (5) and a higher frequency of individual ratings. This highlights how the latter produced a more consistent response, with the average rating being 4.33/10 (slightly less than *Neutral*). Consequently, it suggests how urban obstacles (mainly skyscrapers) can curate more of an unpredictable response

regarding the magnitude of effect on users of the interior space: it may be more beneficial to display high-rise interiors, within an environment similar to *Urban Enclosed*, on a day in which it seems to better imitate a *Natural Enclosed* visual . This can possibly help curate a more predictable user response and influence buying behaviour.

Overall, results from the laboratory experiment concludes that there is conclusive dislike towards urban high-rise views, with natural views producing positive responses (regardless of its open or enclosed nature), supporting previous research by Rathmann et al. (2022). Furthermore, due to weather and lighting conditions of the external view, visual elements (specifically brightness and colour) in the interior space can be highly affected, ultimately affecting the interpretation of the space through semantics. Finally, when considering the marketability of the space towards potential clients, it would be more beneficial to display high-rise units already situated in an enclosed urban environment, on a day where the exterior better resembles a more natural environment. This would be mainly done through the opportunity of a more vibrant (blue) sky where the presence of grey skies, which could darken the interior and create a 'gloomier' atmosphere, can be reduced.

Methodology 3 – Semi-structured interview

Preparation

Referring back to the topics of interest generated from the literature review, the semi-structured interview intended to address the themes most suitable to fulfil the primary objective: *To gain further qualitative insight into the relationship between the user's perception of a space and experience, through participant experience, using* ***semi-structured interviews***.

Theme	Question	Research answered
Presence of nature	• Which view had the most amount of greenery/nature to you? • Which space did you prefer, and why?	**Olszewska-Guizzo et al (2018)** – Positive emotional states.

	• Which view provided the most contrast from the interior? • Did this view affect the way you saw the space?	**Abd-Alhamid, Kent and Wu (2023)** – High content views
Role of the Interior Designer	• Did the space feel well planned out/functional?	**Bettaieb & Alawad (2018)** – Role of the Interior Designer
Emotional Experience of the User	• Do you feel that you focused on a specific subject matter more than anything else? • How did you feel when you first saw the space? (vague)	**Chatterjee and Vartanian (2016)** – Mirror-neuron system and empathetic response.
Desirability of the Space	• Did the view with more nature make the space seem more vibrant, bold, or bigger? • What aspects changed? • What aspects would you change if you were to design the interior space? • If you were looking for a luxury apartment, which view would make you feel most likely to set down a deposit/buy the space?	**Lupyan (2017)** - Tangible factors of perception (attending).
Safety/Privacy	• Did the idea of external skyscrapers worry/concern, or affect your viewing experience? • If you were physically in this space, would you feel safe to dwell here? • Would you feel relaxed to live here? • Which view outdoors made you feel the safest? Why?	**Rathmann et al (2022)** – User comfort and safety due to visual exposure. **Abd-Alhamid, Kent and Wu (2023)** – user restoration and recovery.

Table 6 Questions for the Semi-Structured Interview, with relevant research rationalising intention for use

The questions were kept short and simple to allow participants to expand fully on their answers. Furthermore, if questions were long winded, it could have caused confusion and possibly led to a less regulated approach to asking the questions, from the interviewer's point of responsibility.

Following a piloting process (refer to Appendices 12), changes occurred to the execution of the interview itself, helping to regulate conditions across participants.
Finally, themes in post-collection data analysis were determined through criteria for high-information content views (Abd-Alhamid, Kent and Wu (2023), and identified through recorded transcriptions (refer to Appendices 13).

Results

Focusing on the criterion of *sensory change to the interior space* (Abd-Alhamid, Kent and Wu, 2023), users' preferred view was not necessarily the one which provided the most contrast from the interior space itself. The urban conditions were chosen as those which provided most contrast from the interior, yet the natural conditions (specifically *Natural Open*) were the commonly preferred visualisations. A key finding was the importance of the external weather in the exterior view has on emotional states: nicer weather (blue skies) was preferred and encouraged a positive perception of the interior environment, whereas bad weather (grey skies and wind) negatively affects the user experience within the space. Consequently, the quality of the exterior weather was found to be crucial in determining the perceived mood and atmosphere in the interior space: the quantity and proportion of the natural elements in the view, determined by horizontal stratification (Kent and Schiavon, 2023), can be further developed through this finding. This further supports findings in the previous two methodologies.

Developing on from this concept of emotional influence, findings support Lupyan's (2017) research, regarding the tangible effects attending has on visual perception. The urban conditions had a negative effect on the perception of the interior space, causing the interior to feel more enclosed, and darker, through the dulling of colour, thus evoking a gloomier atmosphere. Natural conditions made the interior feel more open, vibrant in colour, and brighter, creating a more inviting atmosphere. Considering the previous findings of the importance of colour within the interior space, and its ability as a tool of communication of designer intention, this finding encourages a focus on the importance of weather conditions and its relationship with the

vibrancy of hues within the interior space: its ability to emphasise and reduce vibrancy within the interior.

According to the findings, feelings of safety can be created in the interior of high-rise spaces using window treatment - blinds can be used to hide the view when not desired.
Though the *Natural Open* condition was chosen as the view providing the highest levels of perceived safety amongst participants, the provision of safety from *Natural Enclosed* was debated. Specifically, regarding the perception of external users at similar heights (in exterior buildings) some participants claimed feeling safe in the *Natural Enclosed* condition due to the acknowledgement of other dwellings/structures, and the idea of legal approval, to be built at such a height (placing integrity in the physical structure itself), whereas others claimed feeling uncomfortable due to visual exposure to these external users (reducing view enjoyment). This supports the prospect-refuge theory (Hwang and Lee, 2018) and identifies the two main categories of this theory (privacy and safety/user recovery). Weather, in the *Open* conditions, was also found to affect perception of safety: in the *Urban Open* condition, the bad weather conditions made participants feel less secure in the interior space itself. This helps support the idea of perceived user safety, determined by the integrity and safety of the physical structure itself: wind and rain could move the high-rise itself, causing distraught and feelings of anxiety.

Supporting previous findings of perceived user desirability of an interior space, the use of colour and variety of textures and surfaces (to help encourage feelings of coziness), was given as participant suggestions, when asked to reconsider design elements within the space. This is significant as it highlights practical application of previous untested findings in the first and second methodology: these were innate tendencies which arose, unprompted by the interviewer.

Considering the economical context and nature of domestic building design, it was crucial that user desirability and emotional state was considered, regarding buying psychology. Results from thematic analysis determined *Natural* conditions as the most preferred views, leading to encouragement of economical commitment of users. Key factors in influencing preference were

the user's enjoyment of the view (defined by the concept of paying for quality of view enjoyment and consequent accessibility to the view itself, with little visual obstruction) and the perceived privacy which would come from one's preferred view. These are aspects which should be considered when designing high-rise buildings, regarding customer and client satisfaction and consequent benefit to the economic potential of units.

Conclusion

Access to a view containing nature and the feelings of serenity it could provide, was of high importance to users. The physical design elements of furniture and windows were most significant in terms of user attention, with the space's overall ability to provide a sense of warmth, coziness, spaciousness, cleanliness and being inviting encouraging positive user perceptions of the space itself. Likewise, spaces conveying a cold, empty and bland impression were found to be least preferred amongst users.

Natural conditions produced an overall positive response, while urban ones conclusively produced negative/neutral responses. Open conditions emphasised how weather and lighting conditions of the external view, can highly affect the visual elements (specifically brightness and colour) in the interior space, ultimately affecting the interpretation of the space.
The importance of perceived privacy and safety affecting user comfortability was highlighted in the semi-structured interviews, with these aspects being affected by the factors of weather and the acknowledgement of external users in neighbouring high-rise buildings. Perceived safety could be encouraged using window treatments (blinds), to help hide the view, and the consequent perception of height, when not desired or in bad weather conditions. Finally, results discovered that the view was a key selling feature in the interior space itself, with users preferring the natural conditions in which the views offered a higher quality of enjoyment of an unobstructed view.

Regarding overall findings of the importance of interior aspects of furniture, colour and user comfort, the interior designer's role in this whole process is crucial: if pre-established structures,

unable to alter architectural design, needs refurbishment or curated design of the interior, a professional interior designer could incorporate and prioritise the key elements found (furniture colour and style, perceived safety and privacy, and cohesion with the exterior space with intention to increase user comfortability) to help influence perceived user desirability and encouragement of economic potential for the establishment.

Discussion/Further Work

There are some areas of interest which are worth further exploration. The metaphorical representation of designers emotional and experiential intention, relating to the mirror-neuron system (Chatterjee and Vartanian, 2016), is one of these aspects. Through this research paper, the key physical aspects of the space, which the designer should pay most attention towards to help communicate emotional/conceptual intent to the user, have been discovered. By possibly interviewing interior designers about the logistics of conveying emotion, through their design decisions and process, a clearer picture of the relationship between the tangible product and conceptual and emotional nature of interior design could be established.

Another area of interest would be further exploration into the *interactional* relationship between the user and their environment: understanding the living relationship between the user and the space which they inhabit, and whether there is more to the semantic interpretation of spaces which could be explored. How could this help to develop the experience and selling points of high-rise living? Could this be used to explore a larger or more niche demographic of clients?

Finally, one aspect of this research which could be explored through experimentation and design development would be the connection of interior space and exterior environment itself. By focusing on enhancing a more cohesive and innovative experience, pushing more towards an innovative way of living which can still create a sense of safety in novel spaces, further unique interior experiences could be developed, and possibly help shape the future of creating desirable innovative spaces for users and clients.

Appendices

Appendices 1 - Extensive Literature Review

Urban City Environment

Having looked at research relating to the urban city environment, it indicates that the higher a living space is, the more deprived physical contact with the outdoors is (Olszewska-Guizzo et al., 2018). This is due to the necessity to go through a system (stairs, elevator, escalator, etc…) to physically enter the urban environment itself. It was also found that the interpretation of the environment (the urban skyline) is impacted significantly by the meanings associated with the buildings themselves (Karimimoshaver and Winkemann, 2018).

One common theme found throughout research was the importance of nature, in the window view, of high-rise spaces. Not only does a larger proportion of green cover, in the urban environment, contribute to brainwave patterns associated with positive emotional states (Olszewska-Guizzo et al., 2018), but it was also found that designing for nature, through horizontal stratification, had a large influence on psychological restoration and positive affect (Kent and Schiavon, 2023). These findings were intriguing, since it highlights the significance nature has on human emotion and viewer experience. Therefore, suggesting that the presence of nature in the urban environment view could possibly influence bias and judgement of users' physical spatial context: does this connection to nature in turn significantly affect the users perceived desirability, comfort, and emotions in the space? E.g. a fully urban environment with little consideration to nature is more likely to reduce positive emotions. This can in turn create negative bias towards the user's present physical situation. Could this therefore negatively affect the user's overall desire, and emotions associated with the space?

Ultimately, could it affect the marketability and economic potential of the space itself and therefore maximisation of profit/resources used by the interior designer? This is something that seems worth exploring through primary research – whether the effect of nature in the urban environment on user experience, significantly impacts the decision-making in disliking or liking a space enough to purchase/own the space itself.

Logistics of human sight, perception, and psychological implications

In relation to user wellbeing, it was found that external views provided a sensory change to the interior space, proving to be crucial both the psychological and physiological wellbeing of the user. Specifically, high information content views provided visual access to environmental information and connection to the exterior world, encouraging user restoration and recovery (Abd-Alhamid, Kent and Wu, 2023). It was further explained, despite the effectiveness of reducing user annoyance, views of nature were not found to be constantly more desirable than urban views, rather it was the view content itself which determined this. More specifically, the preference of high-information content views was dependent on their ability to provide:

- Access to environmental information
- Sensory change
- Connection to the world outside
- Restoration and recovery

By utilising these criteria, the difference between the effect an exterior view of a more urbanised or natural environment has on user experience and perception of the interior space can be explored. Furthermore, these categories can be used in thematic analysis, regarding primary data collection, to help identify appropriate patterns, helping to make informed and rationalised conclusions.

Having found this, Rathmann et al. (2022) found that human visual systems process certain aspects of a natural landscape more fluently, making it more likely for one to evaluate it more positively, suggesting an innate evolutionary preference towards a natural environment.

Furthermore, the two concepts of safety and visual privacy were crucial in assessing view preference within a space. Regarding safety, a preference to spaces where one would be on the edge (in which there would be more exposure towards the elements and predators in the evolutionary environment) rather than the middle was found (Rathmann et al., 2022).

Visual privacy, described by Zheng et al. (2021) relates to the factor of visual distance between one element and another. Regarding high-rise living and elevation, it was found that the middle floors of a building tend to suffer most from the perversion of visual privacy. Consequently, highlighting how the higher one goes up, more visual privacy from the exterior is not necessarily guaranteed. This concept of visual privacy is an interesting aspect to explore: could a view lacking visual privacy significantly reduce user comfort and perceived safety, and thus experience of the interior? What factors are different between an urbanised and natural environment, and how could the relationship between these and the user create/reduce visual privacy? Do other high-rise buildings act as visual obstacles from the outside, therefore increasing visual privacy? Or does the knowledge of other dwellers in said high-rise buildings counteract this? These are questions and aspects which are worth exploring.

According to Raftopoulos and Lupyan (2018), an individual's perceptual experience of a single sensory input can be highly influenced by their attentional state in the moment: what one perceives changes depending on what one attends to.

They further explain that 'attending' is a cognitive process that incorporates one's knowledge, goals, and expectations, thus demonstrating that attention makes use of learned object knowledge, and is not limited to systems which utilise basic, non-semantic, visually perceived features of a stimulus. Consequently, highlighting the importance of individual factors on the subjective viewing experience. Regarding high-rise views and interior spaces, object knowledge could refer to monuments; personal experience in the urban environment and interior space/style; and individuals' reflective behaviours, fears, and desires.

By performing a scoping study of participants individual experiences with the chosen urban environment and high-rise interiors, the researcher can determine which factors can affect participants' experience overall and choose to control possible extraneous variables or find commonalities between them.

Looking deeper into the relation between attention and perception, an article previously published by Lupyan (2017), highlights how attending improves both objective performance and

subjective perception. It can enhance contrast, saturation, and changing perceived stimulus size: the idea of “seeing” and “not seeing” depends on the ability to attend correctly. Overall, it was found that attention vastly permeates perceptual processing, from visual to auditory processing being affected. Describing the locus of selection (attending to chosen stimuli), Lupyan (2017) emphasises its dependence on perceptual and attentional load.

Unfortunately, this only applies if attention is viewed as a post-perceptual process. He does emphasise that the process of perception isn’t affected, but rather the stimulus itself (a pre-perceptual debate). Therefore, only the stimulus inputted to the mechanism changes, not the mechanism itself.

Understanding the significance attending has on specific, tangible factors of perception, can help with determining the specific aspects of participant behaviour and experience the researcher chooses to analyse in the primary experiments: these factors, acting as dependant variables (DVs), can be judged against independent variables (IVs) to determine if and how perceptual relation between high-rise views and interior space could occur.

The Interior Design of high-rise domestic interiors

Design styles of high-rise domestic interiors

Conducting a case study on real-life examples of luxurious high-rise domestic interiors, research identified that there was utilisation of different design techniques supporting psychological behaviour towards interior design. Looking at examples published on Dezeen.com, it was identified that design techniques were implemented to oppose innate negative human reactions. For example, the new residential high-rise building 44 East in Austin, Texas, USA by Michael Hsu Office of Architecture was focused on in an article by Sonia Singh (2023).

Applying knowledge from Minarovičá(2016) and Norman (2005), this living room space should produce a negative visceral reaction of displeasure, due to the large glass windows reducing feelings of safety. However, conscious design choices, through the use of soft curves creating a circular space, have been implemented in order to help contrast these negative feelings and increase feelings of balance and unification in the space (Al-Zamil, 2017). Furthermore, Norman (2005) goes on to develop the idea of reflective behaviour, cultivating likes and dislikes, after the

initial visceral emotional reaction in subjective experiences: this could help explain why this space, as a high-rise luxurious space could be perceived as exhilarating and desirable. This example highlights the role of the interior designer within the space: if opposite design choices were taken (such as using harsh, geometric forms alongside uninviting colours), the visceral negative reaction to a high-rise view framed by completely open glass windows and doors could have been encouraged, rather than combatted.

Furthermore, connection to the exterior environment is significantly influential in the design choices of the interior furnishings. From colours and curved surfaces inspired by the nearby Colorado river to a kitchen bathed in darker colours intended to complement the skyline at dusk time (Singh, 2023), it is clear that there has been an effort to inject the space with the essence of the surrounding exterior. By utilising the aspects of the visible exterior environment, this interior space is an example of designing for nature, an aspect which has been found to have considerable influence of psychological restoration and overall positive affect (Kent and Schiavon, 2023). Considering this is a recent example of high-rise architecture, it proves significant to fulfilling the objective of identifying what the design trends and choices often found in high-rise domestic buildings: contemporary luxury high-rise design is moving towards and incorporating the aspect of connection between the interior and exterior not only through physical connections (architectural design), but also through specific and intentional aesthetic design choices (highlighting the role and significance of the interior designer in determining user psychological comfortability within and desirability of the space).

Aspects determining the beauty and desirability of the space

Described by Chatterjee and Vartanian (2016), aesthetic evaluations can be defined as appraisals influencing important aspects of human behaviour (such as mate selection, consumer behaviour and art appreciation). Regarding the judgement of an interior space, beauty assigned to said space is determined to be one of the most crucial factors driving the desire to live there.

It is then further explained that these aesthetic experiences likely come from the interaction between “emotion-valuation; sensory-motor; and meaning-knowledge” (Chatterjee and Vartanian, 2016) neural systems.

The emotion-valuation system was found to be significant in the assessment of attractiveness (positive-valence appraisal). Looking at the activity of certain brain regions through sensory modalities (visual, auditory, gustatory, olfactory), the region most associated with visceral perception and negative emotions was key in all said modalities. Linking clearly to Emotional Design by Norman (2005), this finding regarding visceral perception is supported by the theory that humans experience a visceral behavioural reaction to certain stimuli. In the article by Chatterjee and Vartanian (2016, p. 175) it is further developed to explain how “structures involved in visual perception can also contribute to the computation of value and preferences.” Consequently, this helps to solidify the relationship between the concept of visual perception and subjective preference through a more empirical approach, in which the psychological theories are supported.

When experiencing art and design, there are many factors of the piece each viewer takes notice of: size, colour, form, etc… However, a less tangible - yet just as significant - aspect is prevalent in almost all human design: emotion. The mirror-neuron system, within the sensory-motor system, can be used to explain how this key factor influences people’s aesthetic preference and appreciation.

The mirror-neuron system describes when mirror neurons respond, both when an individual completes an action, and if/when they observe a similar action being completed by another agent. Though research was initially done and completed on macaque monkeys (Gallese et al., 1996 referenced by Chatterjee and Vartanian, 2016), there is a similar system found in humans, in which it extends beyond the motor cortex (Chatterjee and Vartanian, 2016).

When applying this system to art, it was explained that empathetic responses to artwork engage one’s emotional circuitry, therefore mirroring the emotions portrayed in the artwork itself: the viewer’s emotional response can mirror the emotion(s) portrayed in the piece.

Having explained the link between emotion and perception, this poses the question: when there is no explicit subject matter to showcase human emotion and experience, how do interior designers convey (and thus evoke) these feelings in their designs? To what extent can a design push itself to, to showcase and evoke human reaction, and yet still be aesthetically and functionally desirable and pleasing? Through interviewing participants of both a design and non-design background, the researcher hopes to resolve these questions.

Hendy (2021) describes how beauty is determined by correspondence to the individual's personal attitude; contemporary nature and compatibility with technology; and the interdependence of nature in the exterior and interior space. This relates to blending the indoor and outdoor spaces. Regarding the aspect of innovation and unusual spaces in design, it is believed that they can be perceived as beautiful due to the constant human passion for change, exchange and instability being expressed.

Furthermore, Hendy (2021) further explains how Interior Design is unlike typical art, given that the user is fully enveloped in it. Consequently, this evokes positive and negative senses momentarily. This helps to support the previous idea that the idea of momentary emotion and user experience has a tight and complex relationship with the interior design of the space itself. Therefore, in this regard, beauty or ugliness is harder to objectively determine, considering the experience is dependent on the user's personal feelings and associations. At its core, if a space, via its elements, correspond with the person's psychological state and/or beliefs, it can be considered beautiful; if it contradicts their essence, it is more likely to result in a negative response and dislike (Hendy, 2021). As the research intends to explore the role of visual connection to the urban environment in the domestic interior and considering the idea that the residential space is where one seeks their personal aesthetic and desires to be fulfilled the most, it is crucial that through the scoping study, general themes of participant likes and dislikes can be identified, in order to help inform the selection and organisation of interior elements. Furthermore, by using thematic analysis with the user associations of like and dislike, common

themes which help distinguish the two groups can be identified (e.g. comfort, self-identity, domesticity, safety/danger, etc…).

Shapes and sizes of high-rise floor-to-ceiling windows

Moscoso et al. (2021) found that window size in conjunction with volume of the interior space played a key part in user spatial perception and satisfaction, with larger window sizes being the most preferred generally, and leading to positive evaluation of the space. However, when considering preference for window size in relation to the proportion of exterior views, the smaller space led to higher ratings of satisfaction. Consequently, this highlights how the spatial relation between the two variables of the interior context (volume of the space) and the placement of windows, affect window size preference. This relationship is something that has significance in the logistics of establishing an appropriate method of primary experimentations: by utilising these findings, the research can directly focus on exploring the relationship between the two variables rather than simply identifying preference. Rather than simply identifying "what" exterior view is most preferred by the user, the "which" and "why" of the preferred view can be explored, in relation to its effect on the perception of the interior space.

Relating to the concept of safety and innate human preferences, Hwang and Lee (2018) describe the prospect-refuge theory as an explanation to the human preference, to remain in spaces where one can see and assess their surroundings without being perceived from the outside. These spaces provide opportunity for restoration, concentration and safety/relaxation. The characteristics which affect prospect-refuge conditions are split into the two groups of the outdoor environment (natural factors and surroundings of the building location) and the built environment (design choices such as building orientation & position, floor level, fenestration). By splitting the design of an interior space into these two main sections, it can help act as two main categories when assessing and analysing data collected in the primary research. Furthermore, by dividing the space into these categories, it could provide more direction and control to the selection of independent variables which the researcher could change and test.

From the perspective of Minarovičová (2016), windows have both a functional and symbolic purpose. Functionally, windows act as protection against the exterior elements and as connection to the exterior. Symbolically, they act as protection of user privacy and as a form of key architectural expression. One key aspect that stands out is that completely opening the interior via glass walls or large windows can reduce feelings of security and refuge. This supports the idea of the prospect-refuge theory as the provision of refuge is compromised if the condition of a completely open interior is fulfilled. This is crucial to consider when looking at high rise spaces and optimising a positive user experience: when completing primary design research, there must be a good balance regarding the amount and proportion of full floor-to-ceiling windows, as it could go past the threshold of providing rich and expansive visual content, and into the reaction of danger and lack of security.

The domestic interior and user personalization

As described by Bettaieb and Alawad (2018), the domestic space cannot be considered exclusive from Maslow's hierarchy of Needs. They explain how the architectural form of "home" emerged from the human need to shelter from environmental factors. More specifically, the concept of "home" comes from safety and security needs, while the concept of "shelter" comes from physiological needs.

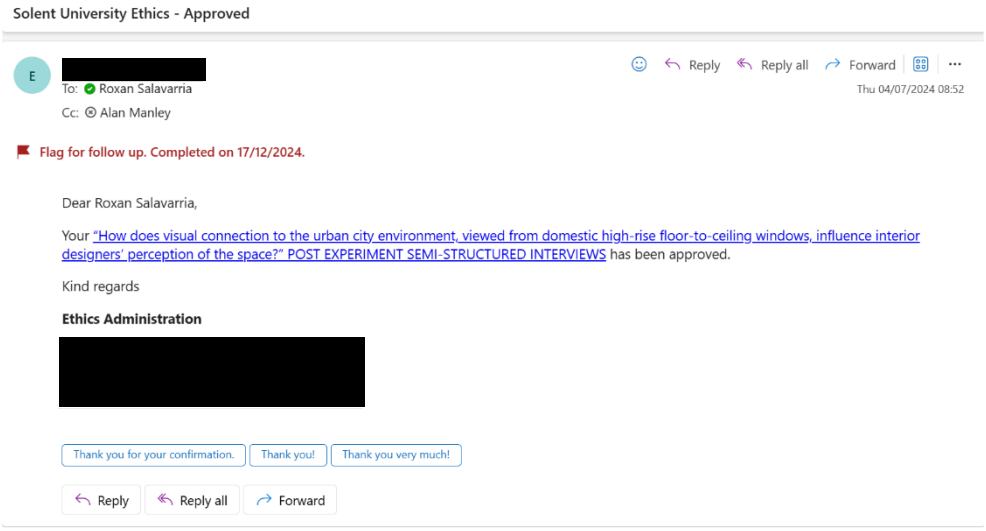
It is then further determined that there are specific constants, which act as common denominators among all residential environments; these constants emerge from material and non-material needs. In relation to these constants, the role of the interior designer is to fulfil five main ones (Bettaieb & Alawad, 2018):

- Fulfilment of **utilitarian sensory expressive needs** (this is dependent on the context and requirements of the project).
- Achievement of **psychological and physical comfort** (this comes as an inevitable result of achieving balance between the tangible and intangible in a dwelling).
- Achieving **interpersonal communication by studying furniture elements, distances and functional division**.

- Achieving **privacy** for every family member with priority for parents.
- Fulfilling **security, safety** and **psychological safety.**

One key aspect in this article is that the role of user is considered within the domestic space. It goes on to explain how the user represents the moral and physical (human) element, embodying the performance of the home and the interaction of components. This is completed through a reciprocal relationship producing warmth, privacy and affiliation. The benefit of this approach is that it supports the idea of a relationship between the user and their environment: an interactional one in which one influences the other. This idea is crucial to fulfilling the aim of the research, in which the user doesn't purely receive visual stimulus, but react psychologically, affecting their subjective perception of desirability of the interior space.

Appendices 2 – Approved Ethical Clearance



Solent University Ethics - Approved

E [redacted]

To: Roxan Salavarria

Cc: Alan Manley

Reply Reply all Forward

Thu 04/07/2024 08:52

Flag for follow up. Completed on 17/12/2024.

Dear Roxan Salavarria,

Your "How does visual connection to the urban city environment, viewed from domestic high-rise floor-to-ceiling windows, influence interior designers' perception of the space?" POST EXPERIMENT SEMI-STRUCTURED INTERVIEWS has been approved.

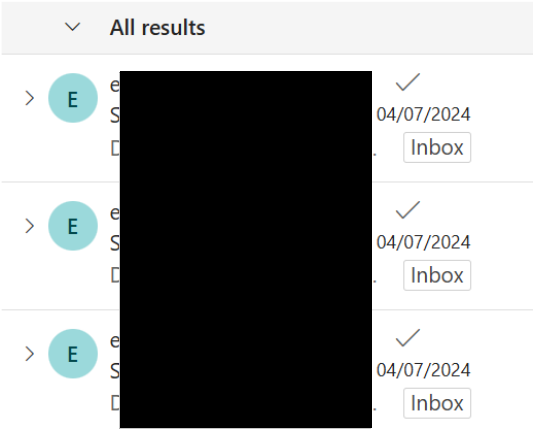
Kind regards

Ethics Administration

[redacted]

Thank you for your confirmation. Thank you! Thank you very much!

Reply Reply all Forward



Appendices 3 – Participant Information Sheet

The researcher would like to invite you to take part in a research study called ***"How does visual connection to the urban city environment, viewed from domestic high-rise floor-to-ceiling windows, influence the users' perceived desirability of the interior space?"***
Before you decide if you want to take part, it is important that you understand what the research is about and what it would involve for you.
Please read the following information and discuss it with others if you wish. If you would like any more information or if anything is unclear, please contact:

NAME: Roxan Salavarria
[redacted]
Telephone Number: 07496924470

What is the study about?
This project will consist of using three primary methodologies, from which you will be asked to participate in one, two, or all of them. It is intended for a Level 6 dissertation project exploring how ***visual connection to the urban city environment, viewed from domestic high-rise floor-to-ceiling windows, influences the users' perceived desirability of the interior space?***
The process of primary data collection, analysis, and formal written work will span from 23/9/24 – 6/01/25.

Who will conduct the research?
Roxan Salavarria: Level 6 IDD student at [redacted]

Why have I been invited to take part?
You have been invited due to your background/lack thereof of a creative (design) field.

What would I be asked to do if I took part?
If you decide to take part in the research, you would be asked to complete one, two, or three stages of primary data collection consisting of:

1. Questionnaire (Online via JISC surveys)
2. Laboratory Experiment (Online via JISC Surveys)
3. Semi-Structured interview (Online via Microsoft Teams)

These will all be done individually and not in a group setting.
You would be contacted via email to continue onto the next stage, if you were to be chosen. This whole process will span the dates 28th October 2024 – 22nd November 2024.
The first methodology (online questionnaire) will start on the 11th of November 2024, and you may be asked to stay on until the 22nd of November 2024.
You will be asked to complete the Online Questionnaire prior to the following two stages of the Laboratory Experiment and Semi-Structured, of which the two latter will take place within short notice of each other.
This would all be done remotely, held online through JISC Surveys, except the Semi-Structured Interview, which would take place on Microsoft Teams via a 30-minute call, where the conversation will be transcribed/recorded through the in-application feature.
Would the interview be recorded?
Yes. The interview will be recorded and used for thematic analysis post-completion. The answering session should not last longer than 30 minutes.
Permission of the participant will be sought beforehand on the consent form and be confirmed at the beginning of the Teams call.

Do I have to take part?
Taking part in the research is entirely voluntary. Those who choose to take part will be asked to read and sign a consent form.

Can I change my mind about participating in the research?
Participants are free to change their mind about participating in the research at any time and can withdraw without giving a reason. They would not be asked to explain their decision to withdraw. If withdrawal AFTER the research activity has taken place, data which has already been processed will be unable to be withdrawn. However, participants will have a period of two weeks (23/11/24 – 8/12/24) to give notice if any withdrawal of data is desired/required, and for it to be extracted and destroyed.

Would my taking part in the research be kept confidential?
All information which is collected about you or during the course of the research would be kept strictly confidential, and any information about you which leaves Southampton Solent University would be anonymised so that you could not be recognised.
It would also not be possible to identify you from any published material arising from the study. You would be asked to sign a consent form which clearly states this.
The researcher would ask for your permission to use direct quotations (which would be anonymised, so that you could not be recognised) in any publications. We would ask for your permission to do this beforehand on the consent form.
During the research, data will only be accessed by researchers from Southampton Solent University. After the study is finished, the data collected will be stored on a secured personal

device until the end of the academic year. The data will then be destroyed permanently afterwards.

How will my data be used?

The data collected during this process will be used for a formal academic essay, produced for the module ADB616 Critical Design Research.

Has the study been subject to ethical review?

The study has met the criteria laid out by the [redacted] Ethics Policy and Procedures.

Who should I contact if I wish to make a complaint?

Any complaint about the way you have been dealt with during the study or any possible harm you might have suffered will be addressed. Please send your complaint to the person below who is a senior University official entirely independent of the study:

[redacted]

Appendices 4 – Consent Form

Online Questionnaire

Response ID: [redacted]
Submitted: 31 Oct 2024 11:12 AM
Duration: 00:10:28

Page 2

Please read and confirm your understanding of each question below.

1. I have been told about the purpose of the project and I understand this.*

Yes

2. I voluntarily agree to participate in the project.*

Yes

3. I understand I can leave the project at any time without giving reasons and that I will not be questioned about why I have left the project.*

Yes

4. The procedures regarding anonymity and confidentiality have been clearly explained to me (e.g. not using my real name, so that anything I contributed to this project cannot be recognized unless I give my consent; that only anonymised data will be shared outside the research team).*

Yes

5. The procedures regarding data anonymity have been clearly explained to me(e.g. not using my real name, so that anything I contributed to this project cannot be recognised).*

Yes

6. I agree to the use of voice recording if telephone, online or in-person interviews are used.*

Yes

7. The use of the data in research, publications, sharing and archiving has been explained to me.*

Yes

8. I understand that the researcher will have access to this data only if they agree to preserve the confidentiality of the data and if they agree to the terms I have specified in this form.*

Yes

9. I agree to the use of direct quotations in publications provided that my anonymity is preserved.*

Yes

10. I understand what I have said or written as part of this project will be used in a formal essay, submitted for the module ADB616 Critical Design Research.

Yes

11. I, along with the researcher, agree to sign and date this informed consent form.*

Yes

Appendices 5- Allocation of topics of interests to specific primary objectives

Objective:	To gather and analyse users' emotional responses, and subjective experiences, towards visual stimulus/simulation using ***Likert Scales*** in the form of a ***questionnaire-scoping study.***

Themes/Topics to cover	• Scoping study – helps to regulate/control EVs.
	• Attention to stimuli – uses learned object knowledge. Highlighting importance of individual factors on subjective viewing experience.
	  ○ Which factors are common between pps, and which are unique to individuals? Control of EVs.
	• Interior design – attempt and conscious effort to connect exterior and interior environment (architecturally and aesthetically). Role of the interior designer.
	  ○ (Bettaieb and Alawad, 2018) – five main constants in all residential environments, which the interior designer should fulfil.
	• Art and emotion: connecting the user and designer through design and intention. Empathetic response to art through the mirror-neuron system (the viewer empathises with the emotion portrayed by the subject matter).
	  ○ If the subject matter is not explicitly a human being, what is? What to users' focus on? What affects them the most emotionally?

	○ **What extent can a design push itself to that it evokes human reaction, but is still aesthetically and functionally desirable and pleasing?**
Laboratory Experiment	
Objective:	To explore how floor-to-ceiling windows influence the relationship between the perception of the interior and the external view using a ***controlled laboratory experiment***.
Themes/Topics to cover	• Which views works best in conjunction with the space to encourage positive perception? • Visual privacy: does a view lacking visual privacy significantly reduce user comfort? ○ Do other/surrounding high-rise buildings act as exterior visual obstacles, increasing visual privacy? Or does the acknowledgement of other dwellers reduce this? • Does the window frame act almost as a picture frame in the interior space? Is the view what determines value of a space/does it gain its own artistic significance when placed in the context of an interior space? • Prospect-refuge: splits interior environment into two sections (outdoor and built environment). This can help determine which factors to focus on in designing the space, as well as pps experience (focus on certain stimuli).

	○ What are the most significant aspects people focus on? • Security and refuge: ensure there is a good balance regarding the proportion of floor-to-ceiling windows, so it provides rich visual content, not evoke danger and lack of security.
Semi-structured interview	
Objective:	To explore the relationship between the perception of privacy and height elevation above ground level, through participant experience, using ***semi-structured interviews***.
Themes/Topics to cover	• Qualitative insight into why perception might differ/change. • Does the presence of nature in the urban environment influence bias and judgement of physical spatial context? ○ Lack of nature reduces positive emotions – can it affect overall desire and emotions associated with the space? • Does this affect decision and desire to own/purchase the space? • Interior design – attempt and conscious effort to connect exterior and interior environment (architecturally and aesthetically). Role of the interior designer. Do users consider the impact of the designer or just the design itself? (User personalisation through a designer or the individual themselves)? • Attending affects specific and tangible factors of behaviour (perceptual processing; visual processing (contrast, saturation, perceived size); auditory processing).

	• If the subject matter is not explicitly a human being, what is? What to users' focus on? What affects them the most emotionally?
	  ○ How successful is the designer's intention portrayed in the final design.
	  ○ Does the window frame act almost as a picture frame in the interior space? Is the view what determines value of a space/does it gain its own artistic significance when placed in the context of an interior space?
	• Interior design is unlike normal art as the user is completely enveloped in it, therefore the emotions AND SENSES are evoked momentarily (It is both a mental and physical reaction which happens, but temporarily).
	  ○ Does this mean that the experience is *stronger,* in the sense that it affected user experience more profoundly, not purely 2D?
	• Reciprocal relationship between the user and the domestic space: user represents the moral and human/physical element, embodying performance of the home and interaction of components.
	  ○ This relationship creates warmth, privacy and affiliation.
	  ○ Do my findings support this idea, and thus research aim, where the user reacts psychologically to the

	space (not simply visually receive it)?

To help clarify the direction and purpose of each methodology, the topics of interest and focus identified in the literature review was assigned to each respective methodology. This was then further developed into properly formed questions for the questionnaire and semi-structured interview.

Appendices 6 – Refining the experimental variables in primary data collection

VARIABLE	INDEPENDENT (IV)	DEPENDENT (DV)	CONTROL (CV)
What	Outside view (more urban or more natural – Pleistocene)	User perception of the interior space Is it quality/comfort? SDM	Interior space design Window frame design
Who	Designers & non-designers (24 people)	Designers & non-designers (10-12 people)	Designers & non-designers (50 people)
Why	Explore which view works best to emphasise and encourage intended/positive perception of the space.	Gain further qualitative insight to why perception may differ/change	Can determine common factors/aspects to help reduce EVs. Acts as a scoping study
How	LAB EXPERIMENT: 3D visualisations/renders, using altered photography for the views.	SEMI STRUCTURED INTERVIEWS (POST EXPERIMENT) Vocal/Video recording of conversation. Thematic analysis	ONLINE QUESTIONNAIRE (SDM) Jisc surveys
Primary objective	To explore how floor-to-ceiling windows influence the relationship between the perception of the interior and the external view using a ***controlled laboratory experiment***.	To gain further qualitative insight into the relationship between the user's perception of a space and experience, through participant experience, using ***semi-structured interviews***.	To gather and analyse users' emotional responses, and subjective experiences, towards visual stimulus/simulation using ***Likert Scales*** in the form of a ***questionnaire-scoping study.***

Where	Solent Uni/Online (remote teams call)	Solent Uni/Online (Remote)	Online

The table above displays the clarification process in determining and analysing the Control, Independent, and Dependant Variables, within the overall aim. These are realised through the primary objectives, in which each methodology addresses the purpose/insight each variable provides.

Appendices 7 – Methodology 1 (Questionnaire) Original Questions

Personal information (ages and locations)	• Do you live in the UK? If so, what county and city? • What is your age? • 18-21; 22-25; 25-30; 30-35; 35-40
History/Knowledge with (interior) design.	• Are you professionally trained/qualified in design? • How creative would you consider yourself? (Likert Scale)
History with high-rise apartments	• Have you ever lived or considered living in a high-rise apartment? • Have you ever visited a high-rise apartment in real life? • If money didn't matter, which location would you love to live in a high-rise apartment?
History with luxurious interior design	• How important is ensuring your home is nicely decorated? • What is the maximum amount you would spend to decorate your home? • What is the minimum amount you would spend on your home?
Aspects of like and dislikes	• What is your favourite art/design style. • *show a picture and ask them to rank its beauty? • Which space do you prefer? • How beautiful would you rank this interior design piece? (Likert Scale) • If you could describe the space in 5 words, what would they be? • Why do you like/dislike the space? • What are your favourite colours, textures and shapes?
The role of the interior designer	• What do you believe an interior designer does in a project?

	• How important is their presence in the overall design process?(Likert Scale) • Do you have any interior designers you follow and like the style of? • If yes, who?
Focus/subject matter within an interior space	• What do you notice first when you walk into a room? • How important is the presence of an outside view within a room? (Likert Scale) • Would the presence of nature in the window view affect your decision to move into a space?

Contact Details	• If you would like to continue onto the next stage of experimentation, please enter in your contact details below:
	  ○ Phone number
	  ○ Email address

Appendices 8 - Methodology 1 (Questionnaire) Piloting Process

Certain questions were identified to produce inaccurate answers; edits were completed post-analysis for more refined answers. These were then integrated into the whole list of questions and used in the final online questionnaire.

Original Question	**Revised Question**	**Reason for change**	**Intention for change**
6. Are you professionally trained/qualified in design?	Do you have a design education background?	For participants currently completing a design education, they are not technically qualified and may answer "no." However, they still have training and knowledge which places them in the "creative" group of participants (regarding the questionnaire).	To reduce exclusivity within the creative group of participants: those who have fully received their training in design, and those who are completing their training are included.

12. If money didn't matter, which location would you love to live in a high-rise apartment?	Given an unlimited budget, which **major city** would you prefer to live in a high-rise apartment?	The answers to the original question were too vague and unregulated (from continents to specific cities).	To regulate the quality and specificity of the answers.
36. What do you notice first when you walk into a room?	What is the first physical design element you notice when you walk into a room?	Responses from the pilot study produced fewer tangible results (visual elements) rather than specific items/physical elements.	To identify specific physical features of a room which holds the user's attention first: the item which one resonates with most.
n/a	Do you/Have you experienced a significant fear of heights? Would you feel comfortable looking at a 2D image of a real-life high-rise view?	As this study looks at how high-rise views affect the perception of the interior, participants with a fear of heights can be identified, and excluded from the proceeding steps, to help reduce any pre-determined mental biases regarding high-rise views and heights (thus affecting the overall experience of the space).	To help refine an appropriate selection of participants in the last two methodologies.

Appendices 9 – Methodology 1 (Questionnaire) Revised Questions

Personal information (ages and locations)	1. Do you live in the UK? 2. If you answered "Yes", what county (and city/town) do you live in? 3. What is your age? (Age ranges categorised)
History/Knowledge with (Interior) design.	4. Are you professionally trained/qualified in design? 5. If you answered "No", what is your profession? 6. If you answered "Yes", what is your profession? 7. How creative would you consider yourself? (Likert Scale)

	8. How often do you engage in creative pursuits, on average? (E.g. painting, drawing, designing, playing or creating music, sculpting, filming, etc...) (Likert Scale)
History with high-rise apartments	9. Have you ever lived or considered living in a high-rise apartment? 10. Have you ever visited a high-rise apartment in real life? 11. If money didn't matter, which location would you love to live in a high-rise apartment?
History with luxurious interior design	12. How important is ensuring your home is nicely decorated, to your taste? 13. What is the minimum amount you would spend on your home? 14. What is the maximum amount you would spend to decorate your home? 15. What is the minimum amount you would spend to buy a high-rise apartment? 16. What is the maximum amount you would spend to buy a high-rise apartment?
Aspects of like and dislikes	17. What is your favourite Art/Design style. 18. What is your favourite colour? 19. What is your favourite pattern/texture? 20. What is/are your favourite shape(s)? **Apartment A - Example 1 of a high-rise apartment with an urban view.* 21. How beautiful would you rate this Interior Design, as a whole, on a scale of 0 to 10? **Apartment B - Example 1 of a high-rise apartment with an urban view.* 22. How beautiful would you rate this Interior Design, as a whole, on a scale of 0 to 10? 23. How beautiful would you rate this Interior Design, as a whole, on a scale of 0 to 10? 24. Which space do you prefer the most? 25. If you could describe your preferred space (from above) in five words, what would they be? 26. Why do you like the space? 27. Which space do you least prefer? 28. If you could describe your least preferred space (from above) in five words, what would they be? 29. Why do you dislike the space?

The role of the interior designer	30. What do you believe an interior designer does in a project? (Tick all that applies) 31. How important is their presence in the overall design process?(Likert Scale) 32. Do you have any interior designers you follow and like the style of? 33. If you answered "Yes", who and why?
Focus/subject matter within an interior space	34. What do you notice first when you walk into a room? 35. How important is the presence of an outside view within a room? (Likert Scale) 36. Would the presence of nature in the window view affect your decision to move into a space? 37. If you answered "Yes", why?
Contact Details	If you would like to continue onto the next stage of experimentation, please enter in your contact details below: 38. Phone number 39. Email address

Appendices 10 – Methodology 1 (Questionnaire) Detailed Results

Theme/Topic of Interest	Relevant Research	Question	Results	Conclusion
The Role of the Interior Designer	Bettaieb & Alawad, 2018	***How important is their presence in the overall design process?***	1. Very important – **45.2%** 2. Extremely important – **38.1%** 3. Somewhat important – **9.5%** 4. Neutral – **7.1%** 5. Unimportant – **0%**	The interior designer's role is highly valued by participants, with 92.8% ranking their presence as important.
The Role of the Interior Designer	Bettaieb & Alawad, 2018	***What do you believe an interior designer does in a project?***	Agreeance Level: 1. Create and develop concepts – **92.9%** 2. Spatial design – **92.9%** 3. Visualisations – **90.5%** 4. Meet with clients- **83.3%** 5. Decorate and stage – **83.3%** 6. Technical drawings – **78.6%** 7. Meeting on-site staff – **73.8%** 8. Source and order products – **59.5%** 9. Primary visits – **57.1%** 10. Project management – **45.2%** 11. Online presence management – **42.9%** 12. Paint walls, wallpaper, lay flooring – **38.1%**	

Focal Point(s) in the Interior Space	Chatterjee & Vartanian, 2016	***What is the first physical design element you notice when you walk into a room?***	Frequency: 1. Furniture - size, spatial relations **(13x)** 2. Windows **(9x)** 3. Floor **(7x)** 4. Walls **(3x)** 5. Colour **(3x)** 6. Lighting **(3x)** 7. Shape/Space/Social Places – **(3x)** 8. Ceiling **(2x)** 9. Size of space **(1x)** 10. Structure **(1x)**	
User View Preference	Abd-Alhamid, Kent and Wu, 2023	***How important is the presence of an outside view within a room?***	1. Very important – **57.1%** 2. Extremely important – **21.4%** 3. Neutral – **16.7%** 4. Unimportant – **2.4%** 5. Somewhat important – **2.4%**	
User View Preference	Abd-Alhamid, Kent and Wu, 2023	***Would the presence of nature in the window view affect your decision to move into a space?***	Yes – **69%** No – **31%**	Most participants value the presence of a window in a space.
Scoping Study – Preference of an interior space	n/a	***Which space do you prefer the most?***	1. Apartment 2 – **55%** 2. Apartment 1 – **26%** 3. Apartment 3 – **19%**	
Scoping Study – Preference of an interior space	n/a	***Which space do you least prefer?***	1. Apartment 3 – **74%** 2. Apartment 1 – **14%** 3. Apartment 2 – **12%**	Apartment 3 was disliked by the overall majority.

Scoping Study – User personal likes	n/a	***What is your favourite colour?***	Green – 12/42 = **29%** Pink/Red – 10/42 = **24%** Blue – 9/42 = **21%** Purple – 5/42 = **12%** Brown – 2/42 = **5%** Orange – 2/42 = **5%** Teal – 1/42 = **2%** Yellow – 1/42 = **2%**	Green, Blue, Pink and Red were the most prevalent colours chosen – design lab experiment to work with this colour scheme.

Appendices 11 – Methodology 2 (Laboratory Experiment) Piloting Process

After completing a pilot study of the Laboratory Experiment, little was found necessary to be altered. The main issue was the composition of the exterior view seen in the *Natural Enclosed* visualisation: the placement of other high-rise buildings was different from the *Urban Enclosed* visualisation. This led to a sizeable difference in responses, with a bias towards this view, due to this factor. Below is the revised external view for *Natural Enclosed*.

Using Adobe Photoshop's AI Generative fill, an extra high-rise building was placed in the centre to better echo the buildings seen in the *Urban Enclosed* view.

Previous View	Revised View
	

Appendices 12 – Methodology 3 (Semi-Structured Interview) Piloting Process

Completing a pilot study for the semi-structured interview, little was found to be problematic. The interview itself lasted around 20 minutes and was in-person. This is where the main issue

arose: slight interviewer bias occurred due to human body language (facial expressions, physical readjustments, interaction with papers). It was evident that the participant's experience, and possibly answers, were affected by this. Consequently, this helps to justify the use of a more remote, online approach through the use of Microsoft Teams: human body language is completely removed when the camera option is disabled whilst still allowing for some aspect of human connection, reducing the possible lack of realism due to a contrived environment.

The need for visual prompts/reminders of the interior visualisations was discovered. As memory can be fallible, the use of visual reminders can help to reduce possible individual bias.

Appendices 13 – Methodology 3 (Semi-Structured Interview) (Example of transcript - Participant 3)

KEY:

VIEW PREFERENCE CRITERIA:

Access to environmental information
- Open - enclosed
- (Urban enclosed – skyscrapers)

Sensory change to the interior space.
- High – content; Low - content
- **(Abd-Alhamid, Kent and Wu, 2023 – high content views)**
- Weather

Connection to the world outside.
- Interior Space –
  - View Access

Provision of user restoration and recovery.
- Safety
  - Comfort – discomfort **(Rathmann et al (2022)**
  - Relaxed – Stressed **(Abd-Alhamid, Kent and Wu, 2023)**

Role of the interior designer
- Human element in the space
  - Urban and Natural effect on this.
- Functionality of furniture

Physical attributes of space **(Lupyan, 2017)**
- Change
  - Vibrance, Boldness, Size.

Influence on emotional state **(Olszewska-Guizzo et al, 2018)**
- Positive – Negative - Neutral

Interviewer 0:06

OK. Before I do anything, do I have your consent to record you and use your results in my dissertation?

Participant 3 0:13

Yes.

Interviewer 0:46

All right, so which view to you had the most amount of greenery or nature in it?

Participant 3 0:52

The top two, probably top right.

Interviewer 0:56

And which space did you prefer? And do you have a reason why? If you did prefer one space or the other?

Participant 3 1:05

Top left because even though you can see the buildings and it's a bit lower down, it doesn't feel as high as the other two. On the right they felt really, really high up and it's me feel a bit uncomfortable.

And also the sky as well, obviously.

Interviewer 1:24

And which of you do you think provided the most contrast from the interior so?

Participant 3 1:42

Probably I don't know.

It's. I don't. I don't know what you mean. Like it feels different.

Probably top left.

Just because of the height of it, as I feel like I'd want to look out of that and see things, whereas the other one I'd like. Oh my God, that's so high.

Interviewer 2:20

Yeah. And do you think that the top left one, do you think it affected the way that you saw the space? Did you see it in a sort of more positive light or more negative light, or did it really affect it at all?

Participant 3 2:32

Definitely more positive.
I think I think genuinely because of the blue sky, it just feels a lot more inviting. Obviously, the greyer skies give like a grey feel to the space.

Interviewer 2:45

Yeah, yeah, no, definitely. And do you think that the space itself in the interior was, well planned out or functional?
If not, what would you change or what do you think you would change personally?

Participant 3 2:58

I think it works for space 'cause. Obviously, it's gonna be a high-rise apartment and I feel like they're always quite minimal anyway.
But for myself, I just have more colour probably and maybe some blinds like the electric ones to hide that at night.

Interviewer 3:12

And in the interior space or exterior space, either one or both of them, did you feel that you focused on one specific item or one specific what's called physical object in the space itself?

Participant 3 3:31

I didn't really find myself focusing on, I really just focused on the view the most. And I think it's because of the colour of the space itself being white and then the furniture being white. I feel like there was no real focal point other than the window, if that makes sense

Participant 3 3:51

I did. My eyes did go to the black table and the gold light, but I feel like that's because it's en route to the window, if that makes sense.

Interviewer 3:56

Yeah. So it's almost in your line of direction when you're looking at the actual thing, OK.

Participant 3 4:05

Yeah.

Interviewer 4:08

As a general sort of emotion, or if you could sum it up in like a word, how would you feel if you walked into this space? Would you feel sort of shocked? Would you feel calm?

Participant 3 4:34

Top left one is my preferred one. I think I'd find it quite fun just because I've never really seen a view like that. It's quite a rare experience, but if it was, say, bottom right, I feel like I'd feel bit on edge because it looks windy.

Interviewer 4:42

Let's say the top the natural ones, the ones on the top. Do you think the view itself made the space more vibrant or make it feel bigger or bolder anyway, in comparison to the ones on the bottom?

Participant 3 5:07

Yeah, definitely. I feel like because the ones on the bottom have that grey dark cloud, I feel like that makes it more feel more enclosed, whereas nice blue sky. Obviously, if it was a bit more inviting and like it just gives a whole like a nicer atmosphere for the space.

Interviewer 5:20

Which view do you think would convince you the most to actually set on a deposit or set down a sort of first month payment to actually move in?

Participant 3 5:53

Probably top left just because I'd ask what buildings I could see from there. Where's top right? I'd my eyesight's rubbish anyway.
That's the top right. You can't really make out what's what if that makes sense. It feels too high.

Interviewer 6:06

Do you think - I know that you prefer the natural and close to the top left version, but do you think that the idea of sort of external skyscrapers or external buildings sort of affect or worry or 'cause you worry or concern or sort of viewing experience like having the knowledge that

there is sort of buildings outside, do you think that would affect you if you were in space or not really?

Participant 3 6:35

I think so because only because when I there's someone that I saw on TikTok, basically they moved into an apartment in New York, and they had this amazing view of the Empire State Building and then a skyscraper got built right in front of her thing. So although in these pictures, it doesn't really matter, it could matter at some point, if that makes sense, which you're kind of paying for the view as well. So I feel like if there was something like that to happen, I'd probably move because I'd feel like I don't want to. I could look outside of my house right now and look at a building and. My house is a lot cheaper.

Interviewer 7:13

So would you prefer for it to have sort of buildings outside of it, similar to the ones on the left? Or not really.

Participant 3 7:22

Yeah, I kind of would prefer it if they're in a distance. That's fine. If it was, say, next door and right in front of me, it would it. That would be very annoying.

Interviewer 7:32

Alright. And if you were to physically sort of live in this space, do you think that you would feel safe to actually live there by any chance?

Participant 3 7:43

I feel like just because I've always lived on the ground floor.

Participant 3 7:50

I would certainly at the start feel slightly on edge because I'm not used to that. I don't know how tower skyscrapers really work and like to be lived in. I know how they work, but do you know what I mean? I don't know how it, how it like it would affect me in a way that I think if it's raining and stormy, I would probably just sit in the middle and pray.

Interviewer 7:55

If it was sort of more like a sunny day, like the ones you see on top, you'd feel a little bit safer. When do you, what do you say?

Participant 3 8:21

Yeah, I definitely feel more safer and a sunny day with no if it was windy and rainy, I think that would really make me feel unsafe.

Interviewer 8:31

Which view outdoors made you feel the safest? I think you already mentioned it about being the top left. Do you think that's because of the aspect that it's not completely sort of open or is it, what do you think?

Participant 3 8:42

Yeah, definitely. Probably top left.
I just feel like the one on the right just feels a lot higher. 'cause, you're above all the buildings, if that makes sense.
Yeah, like, like the one on the left. You're like kind of higher. You can see you're higher, but I don't know. It just feels like there's people around, I suppose, whereas on the right. You're like, I don't know how many of 300 floors, half.
That looks quite scary. And cool. I feel like maybe if the cause the interiors aren't extremely homely, if that makes sense, they're quite minimal, so I feel like this is obviously a personal thing as well, because people like minimal, but I feel like if it was to be.

Interviewer 10:09

Yeah, because. It's something more personal to you. You're sort of more comfortable in it. Would you say?

Participant 3 10:12

Yeah, yeah, definitely.

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