

Mapping psychophysiological stress in individuals with unwanted loneliness

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1.INTRODUCTION

Unwanted loneliness is a critical public health issue. Urban environments influence emotions through multiple dimensions, such as greenery, architectural diversity, and traffic intensity. While large infrastructures can cause stress, pleasant environments can have restorative effects This study employs physiological mapping to understand how urban morphology influences stress to enhance social prescribing in Primary Care.

2. AIM

- To analyze how environment in a small town can help alleviate stress in individuals experiencing high levels of unwanted loneliness.
- To identify differential responses to urban morphology to move toward personalised social prescribing based on a patient's baseline clinical condition.

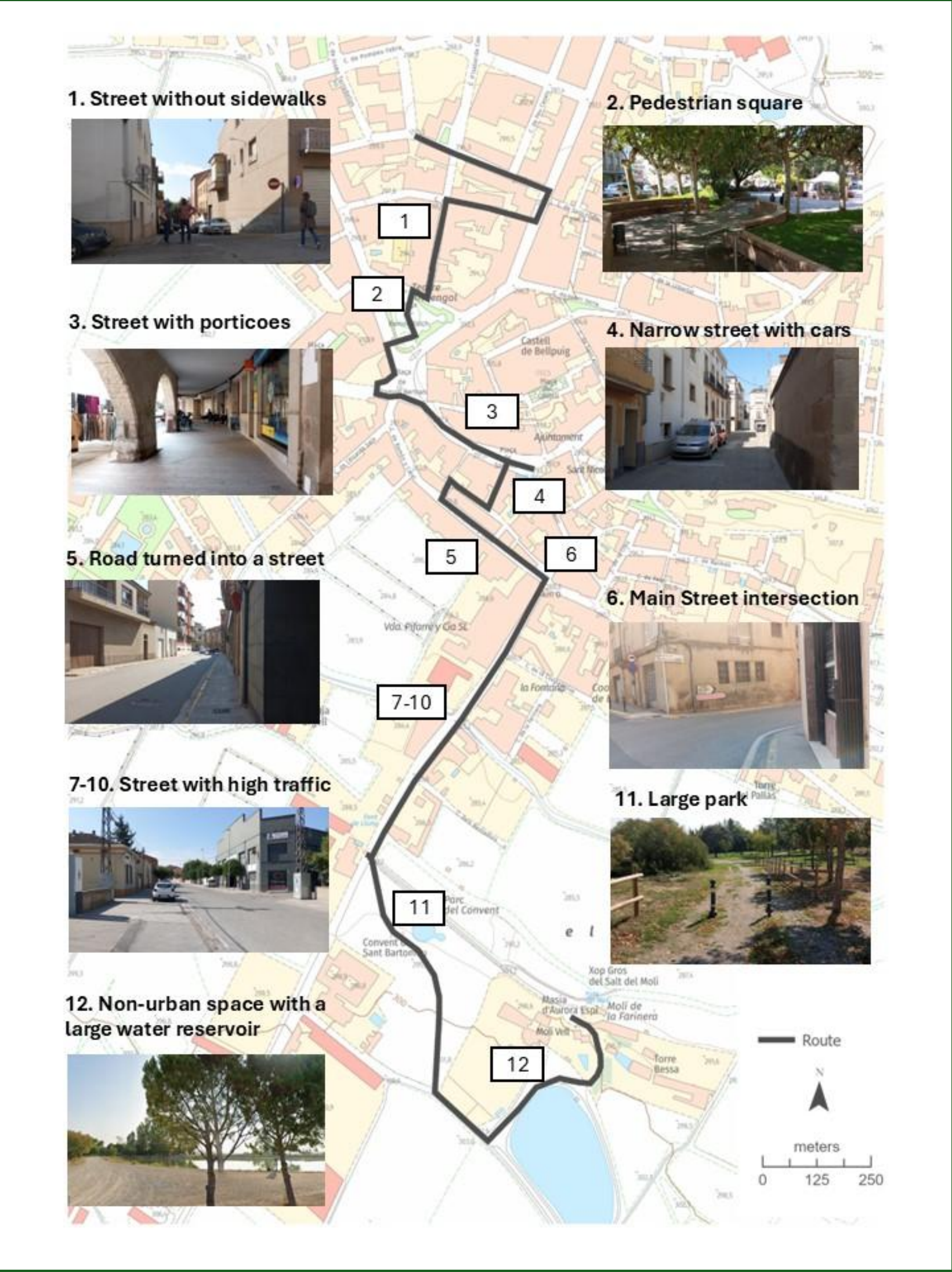
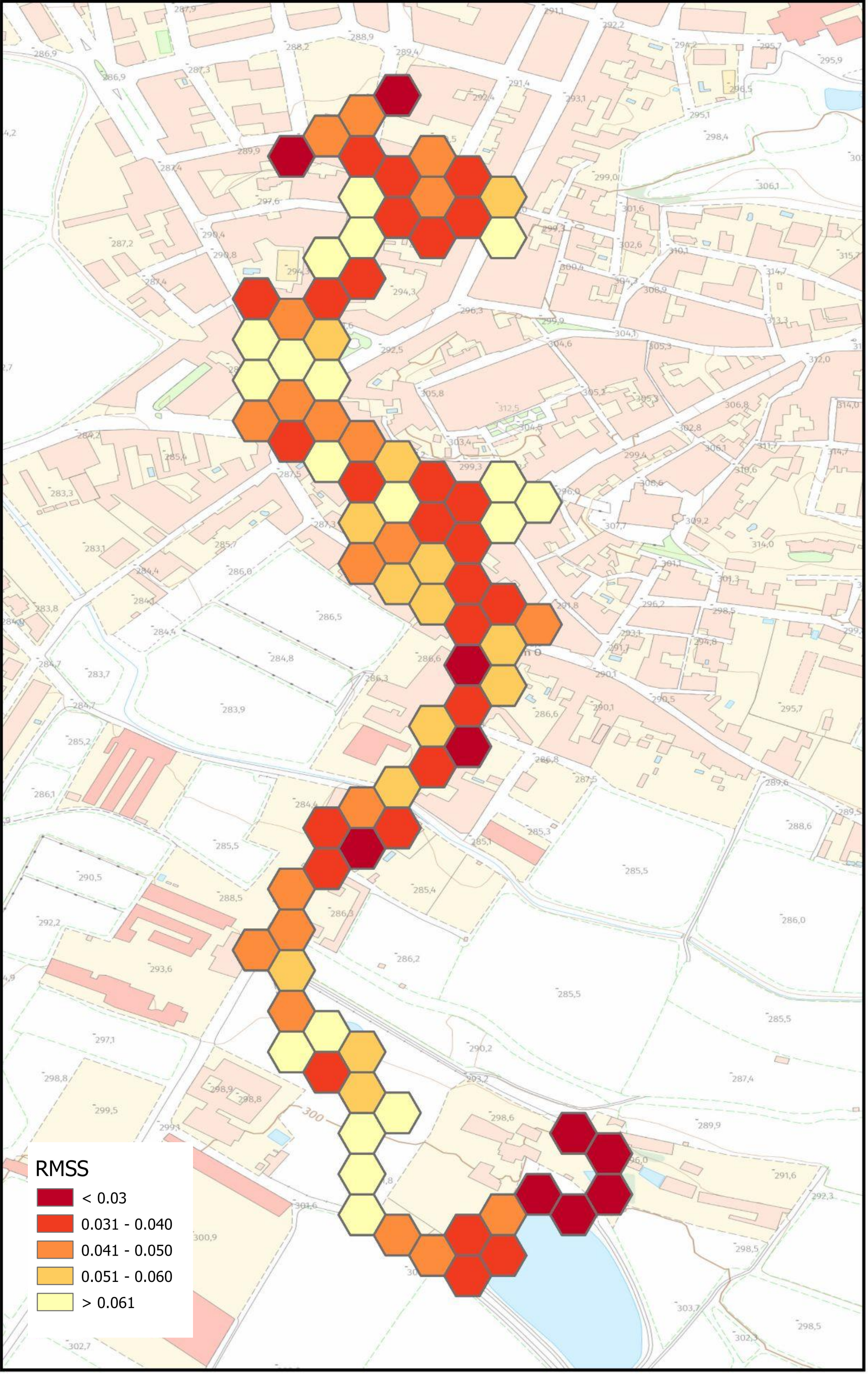
2. METHODS

21 patients from the Bellpuig Primary Care Health Center were screened using the UCLA Loneliness Scale and were classified into two groups: 12 subjects experiencing ‘clinical loneliness’ and 9 subjects with ‘low loneliness’ Data were collected in spring and autumn 2025 during 40-to-60-minute standardized urban walks. Psychophysiological stress was measured by Heart Rate Variability (HRV), using the rRMSSD index (rescaled Root Mean Square of Successive Differences). Lower values of rRMSSD indicate higher stress, and GPS coordinates were recorded and cartographically analyzed.

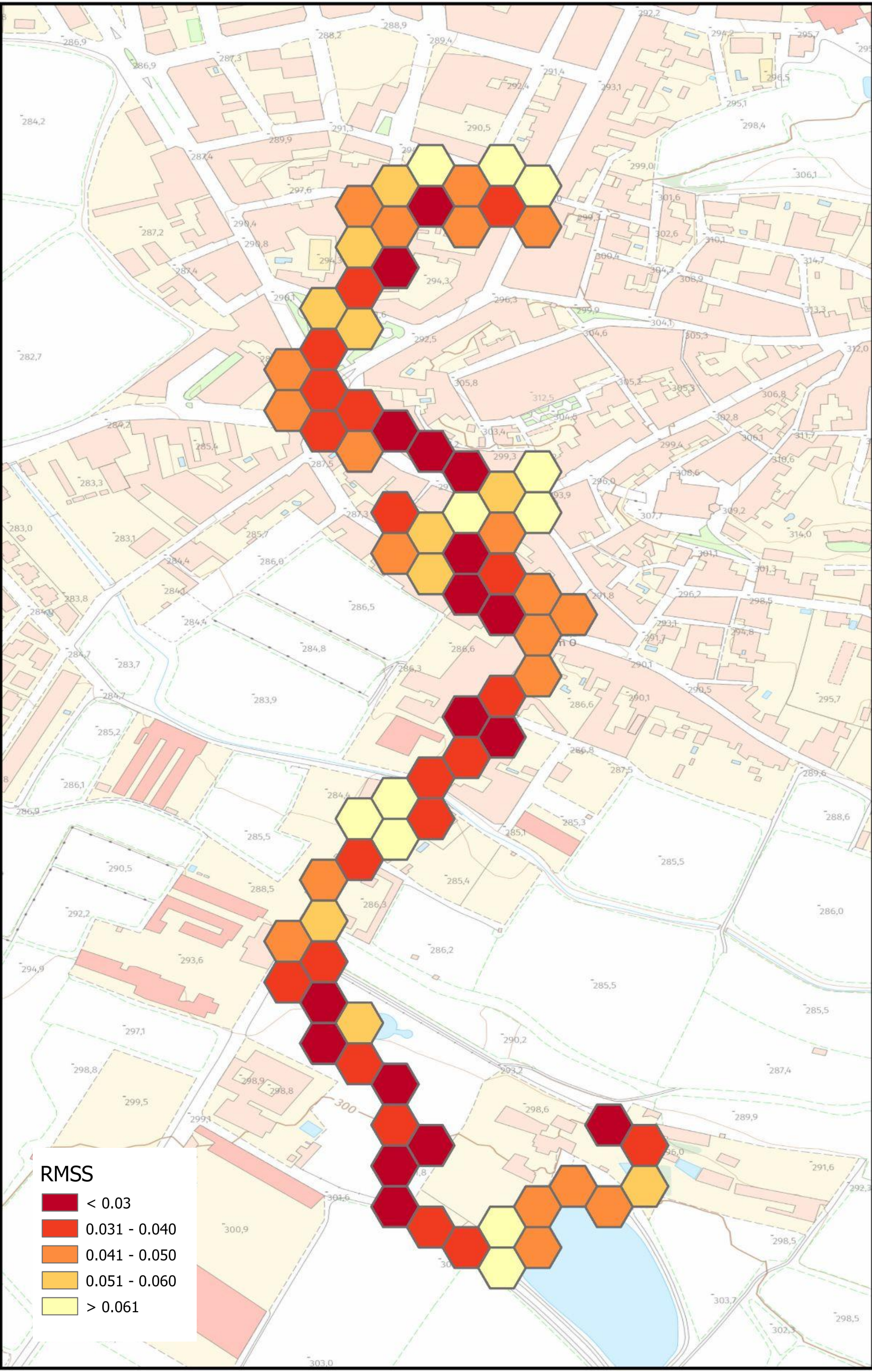
Participants walked a 1.8 km route on their own following a pre-established path consisting of 12 analysis points representing various urban morphologies (historic centre, parks, industrial zones, and bodies of water). Participants wore a watch that continuously recorded their GPS location and HRV.

Social co-presence and enclosed green spaces act as emotional buffers that reduce psychophysiological stress for individuals with clinical loneliness, while open urban voids significantly exacerbate it

MEAN RMSS OF PEOPLE DIAGNOSED WITH LONELINESS



MEAN RMSS OF PEOPLE DIAGNOSED WITH LOW LONELINESS



3. RESULTS

- **The Loneliness Paradox:** Overall, participants with clinical loneliness showed **lower stress levels** (higher rRMSSD) in 8 out of the 12 points compared to the low loneliness group.
- **Social co-presence and greenery:** The greatest differences were found at points 1, 2, and 11. A major factor for the relief observed at Points 1 and 2 was the weekly market. At Point 11 the abundant greenery within an enclosed setting supported the "lean on green" hypothesis. This area provided the loneliness group with a sense of safety and non-judgemental support.
- **The Open Space Contrast:** Moving to the **open water basin (Point 12)** triggered a sharp increase in stress for the loneliness group, as the lack of boundaries and social vitality can amplify feelings of isolation.

4. CONCLUSIONS

- **"Lean on Green" Support:** Nature regulates emotions for those experiencing loneliness, provided the environment is a **bounded natural setting** that offers a sense of protection and facilitates psychological restoration.
- **Personalized Social Prescribing:** Recommendations for "healthy routes" should not be generic. For patients with loneliness, clinicians should prioritise **enclosed spaces with greenery** and moderate social vitality, avoiding open voids.

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