ABSTRACT:
Although daylighting research has produced established metrics regarding human comfort and the energy performance of buildings, we are left with an anecdotal understanding of the perceptual impact of luminous conditions. This shortfall hinders the recognition of the positive impacts of daylight on our appraisal of space and the use of luminous effects as an intentional architectural outcome.

A considerable barrier in the acceleration of research in this subject is the difficulty of controlling the variation in luminous conditions in experimental studies. This thesis aims to overcome this barrier with the development and validation of a novel experimental method using a Virtual Reality (VR) Headset, providing a controlled immersive environment for the conduction of subjective assessments. Findings from experimental studies in the framework of this thesis, which compared the use perception of real environments and renderings in VR, as well as real environments and photographs in VR, are very promising for the adequacy of using the proposed method as a substitute for experiments in real space.

Following these positive results, we aim to assess a wide range of daylight and view conditions, primarily in virtual environments, and investigate relationships between the perceptual aspects of a scene, such as its ambience, and quantifiable characteristics of the façade and daylight patterns in the scene, such as its luminance distribution. Using this method, we can manipulate virtual scenes in a way that is not possible in real space.

METHODOLOGY

ADEQUACY OF EXPERIMENTAL METHOD
PERCEPTUAL ACCURACY OF VIRTUAL REALITY

FAÇADE AND DAYLIGHT PATTERNS
EFFECT OF PATTERN IRRREGULARITY

As each participant saw both the real scene and a pre-rendered virtual scene (left) that best matched the real conditions in each session, we can compare their evaluations in the two environments.

The graphs below, along with the statistical analysis and model development, show a high level of agreement in responses between the real and virtual scenes and are promising for the use of VR in subjective experiments.