Pedestrian walking speed as a tool to study environment-behavior

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Introduction

Feelings of fear are influenced by the environment, being, e.g., the presence of a group of youngsters, environmental aesthetics, or lighting (cf., Painter, 1996). Previous studies have indicated that both felt and recognized emotions alter walking behavior, including walking speed (Gross, *et al.*, 2007; Montepare *et al.*, 1987; Naugle *et al.*, 2010). In contrast to, e.g., face recognition walking speed is a relatively easy measure to extract from video sequences. It therefore is worthwhile to investigate to what extent walking speed is modified by alterations in the environment. As a first step, the aim of the present study is to investigate if an urban street with unlit streetlamps quickens our steps home in comparison to a lightened street or a street during daylight. Although this may seem obvious, it is not and has, to our best knowledge, not yet been investigated.

Methods

Walking speed of pedestrians passing a street near central station of Utrecht (NL) was measured by recording the time a pedestrian took to cross a distance of 10 meters. In addition gender was scored. Three different lighting conditions were examined: (1) daylight, (2) evening with streetlights, and (3) evening without streetlights. Each measurement was performed during 1.5 hour and repeated the next two days, except for the evening-light condition due to extreme weather conditions.

Analysis

Separate analyses of variance (ANOVAs) with repeated measures were performed on the dependent variable walking speed, using a factorial design involving the between subjects factors lighting (three levels) and gender (two levels).

Table 1. Walking speed as function of lighting condition

Conditions	Mean speed	Nr of pedestrians	Nr of days
Daylight	5.12 ± 0.55 km/h	260	3
Evening - Dark	5.37 ± 0.67 km/h	217	3
Evening - Light	4.91 ± 0.51 km/h	55	1

Results

There was a main effect of lighting condition ($F(2,531) = 16.99$, $p<.005$) in that on average the walking speed of pedestrians in the day and evening-light condition was lower than in the unlit evening condition (see Table 1). On averaged, men showed a higher walking speed than women ($F(1,531) = 8.323$, $p<.005$). No interaction between gender and lighting condition was found.

Discussion

This study shows that in the selected urban street a decrease in lighting does quicken our steps home in comparison with the same street when well lit or at day-time. Further study is needed to be able to determine to what extent there is a relation between walking speed and feelings of fear. This notwithstanding, this study provides a first step in a promising approach in evaluating how people will react in different settings. This, in turn will help professionals design environments for maximum safety and enjoyment. In addition, walking speed may provide an effective tool in evaluating (crowd) behavior and signaling changes therein.

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