Stress and Restoration During Navigation through an Urban Environment

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Extended Abstract

When an individual is confronted with a stressful situation, his / her psychological arousal tends to increase. Psychological arousal is difficult to tap directly but can be indicated by any number of physiological responses in the peripheral nervous system (e.g., changes in skin conductance level and / or heart rate; CRITCHLEY 2002). This change in arousal can be labelled "task engagement" or "distress", depending on whether it resulted in a positive or negative change in performance on some task (MATHEWS et al. 2002). To contrast with stress, restoration is associated with a decrease in psychological arousal (DE KORT et al. 2006).

For the present study, we measured changes in psychological arousal during navigation through an urban environment. Participants navigated through a virtual city from one explicit goal location to another with the option of pressing a button to make a compass visible for a limited amount of time. City parks (and other landmarks) were sparsely distributed throughout the city for all participants. Also, eye-tracking, skin conductance, and survey data were used for testing two specific hypotheses related to stress and restoration.

The relationship between stress and navigation has been posited by several researchers (e.g., DUNCKO et al. 2007; GOULD et al. 2009; HOLPER et al. 2013; MURTY et al. 2011). However, there are several shortcomings of previous research, including the evaluation of spatial abilities in small-scale environments (DUNCKO et al. 2007; HOLPER et al. 2013; LAWTON 1994; RAMIREZ et al. 2012), lack of questionnaires used to disentangle positive and negative arousal (e.g., DUNCKO et al. 2007; HOLPER et al. 2013; MURTY et al. 2011), and lack of physiological data for validating participants' self-reports (e.g., LAWTON 1994; RAMIREZ et al. 2012). The present study attempted to ameliorate these difficulties by measuring arousal using skin conductance data, interpreting the valence of changes in arousal using survey data, and having participants navigate through a large-scale (virtual) city.

Navigation becomes especially stressful once one is disoriented (see PASSINI 1984). Depending on the context, disorientation could result in wandering towards dangerous areas or away from food and water. Disorientation may result from lack of salient landmarks (ANDERSON et al. 2011; LIN et al. 2012), distraction by unreliable landmarks (ANDERSON et al. 2011), and so forth. For the present study, we investigated the roles of different landmarks in disorientation and stress (hypothesis #1).

Restoration may also result from elements of the urban environment (GEISER & WALLA 2011). For example, GEISER & WALLA (2011) found that participants' startle response to a loud burst of noise was reduced while (virtually) navigating through a neighborhood containing relatively more valuable property. Previous research has also established that immersion in real natural scenes (BERMAN et al. 2008), viewing a video of a real natural scene on a large projection screen (DE KORT et al. 2006), and immersion in a cartoon-like (virtual) natural scene (VALTCHANOV et al. 2010) all ameliorate stress relative to controls (i.e., a city environment, a natural scene projected with a smaller field of view, and an immersive view of abstract art, respectively). The present study extended this research by comparing measures of arousal during navigation (i.e., in real time) within and without city parks (hypothesis #2).

Keywords: Navigation, skin conductance, eye-tracking, stress, urban design

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