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# Neighborhoods and health: Development and validation of an experimental manipulation of neighborhood characteristics in a virtual reality environment

Daniel A. Hackman<sup>∞</sup>, Stephanie A. Robert<sup>§</sup>, Jascha Grübel<sup>+</sup>, Raphael Weibel<sup>+</sup>, Christoph Hölscher<sup>+</sup> and Victor R. Schinazi<sup>+</sup>

<sup>∞</sup> USC Suzanne Dworak-Peck School of Social Work, University of Southern California; <sup>§</sup>School of Social Work, University of Wisconsin-Madison, Madison; <sup>+</sup>Chair of Cognitive Science, ETH Zürich

## Introduction

- Neighborhood disadvantage is an independent predictor of health through material/psychosocial mechanisms.<sup>1</sup>
- Causal inferences can be limited due to conceptual and methodological challenges.
- Neighborhood disadvantage is hypothesized to influence health by inducing stress reactivity and negative emotion.<sup>2</sup>
- Effects of acute exposure may depend on prior socioeconomic status (SES), resulting in *habituation* or *sensitization*.

### Project goals:

1. Develop and validate an *experimental model, in virtual reality (VR), of neighborhood disadvantage and affluence* to examine causal influences on emotion, behavior, cognition, and physiology.
2. Test the hypothesis that *neighborhood disadvantage elicits differences in emotion and stress reactivity*, and that this is moderated by childhood SES.

## Methods

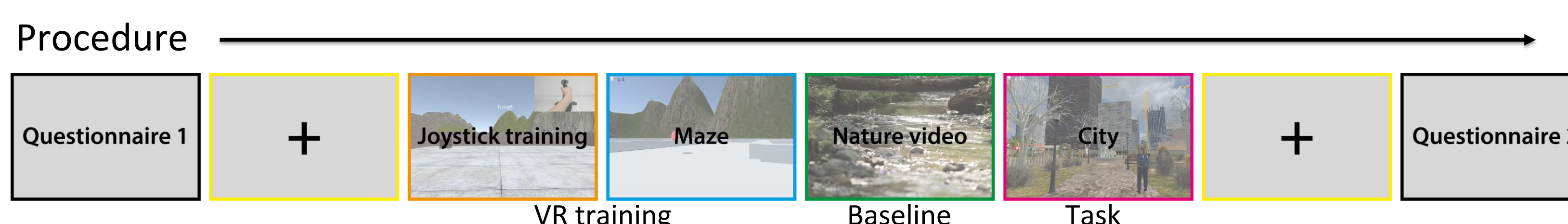
- 68 participants in Zürich, Switzerland: 50% Female, 22.7 years old ( $SD = 2.6$ ), from 19 different countries
- Education level: 39.7% graduate students/masters level, 58.8% undergraduate student/bachelors level
- Parental education: 64.7% had at least one parent with a college degree or higher

Affluent

Disadvantaged

**Creating VR Neighborhoods and Experiment**

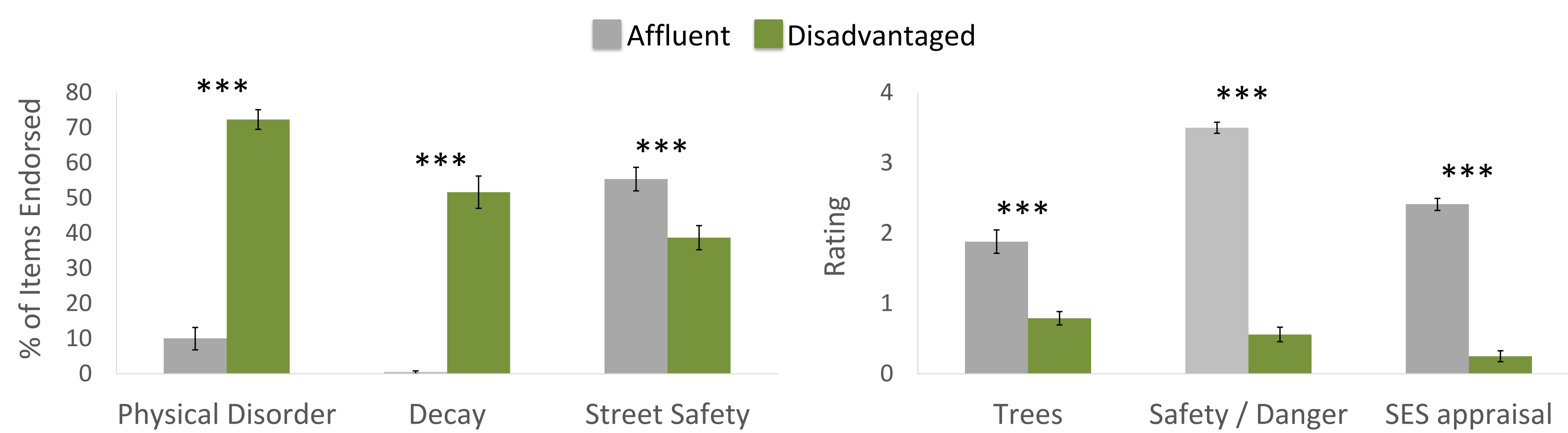
- Design of VR environment based on systematic observations of real-world neighborhoods<sup>3</sup>
- Condition and level of deterioration (e.g., social/physical disorder, graffiti, garbage, green space)
- Spatialized sounds used for different sections
- Human avatars constant across condition
- Participants randomized to neighborhood type
- Task: Follow route and collect "tokens"



- Measures:
  - Neighborhood perceptions: Systematic Social Observation (SSO) – iTour<sup>4</sup>
  - Emotion: Self-Assessment Manikin (SAM; Affect, Arousal) and specific emotions (e.g., fear, happiness)<sup>5</sup>
  - Stress reactivity: Blood pressure (BP; 3 minute intervals) and skin conductance level (SCL; continuous)
- Covariates examined: Video game use, gender, age, education, parent education and motion sickness

## Results: Neighborhood Perceptions

- **Neighborhood type elicits significant differences in perception of neighborhood characteristics:**



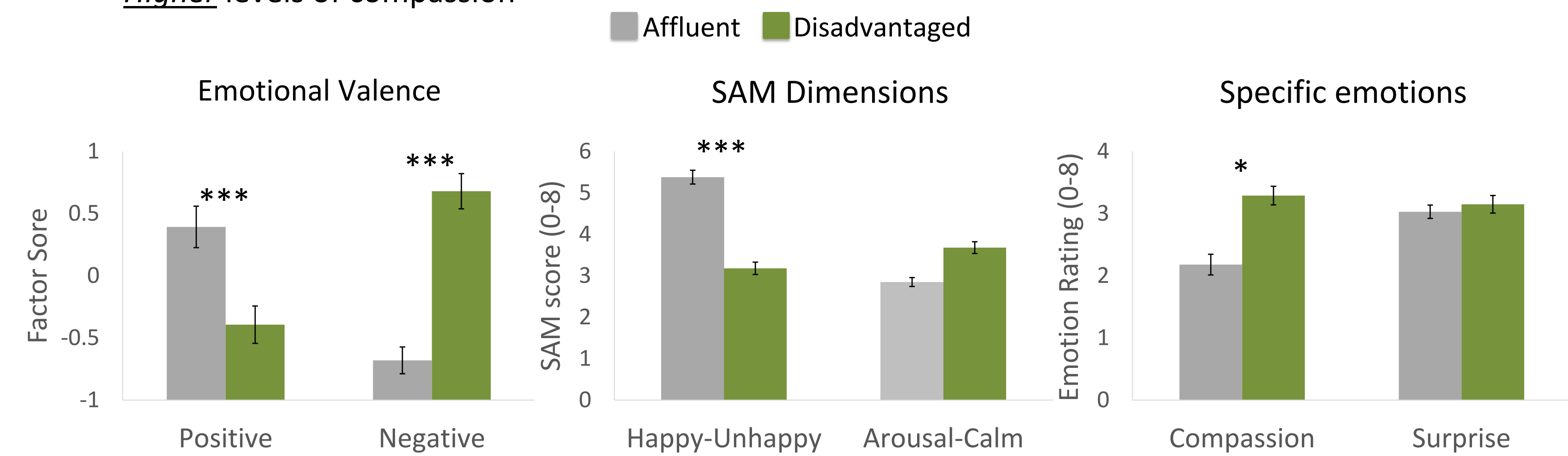
\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

- No differences in the perception of neighborhood characteristics held constant across conditions: Weather ( $p = .64$ ) and Time of Day ( $p = .25$ )

## Results: Emotional Responses

- **Neighborhood disadvantage elicits significantly different emotional responses**

- *Higher* levels of compassion



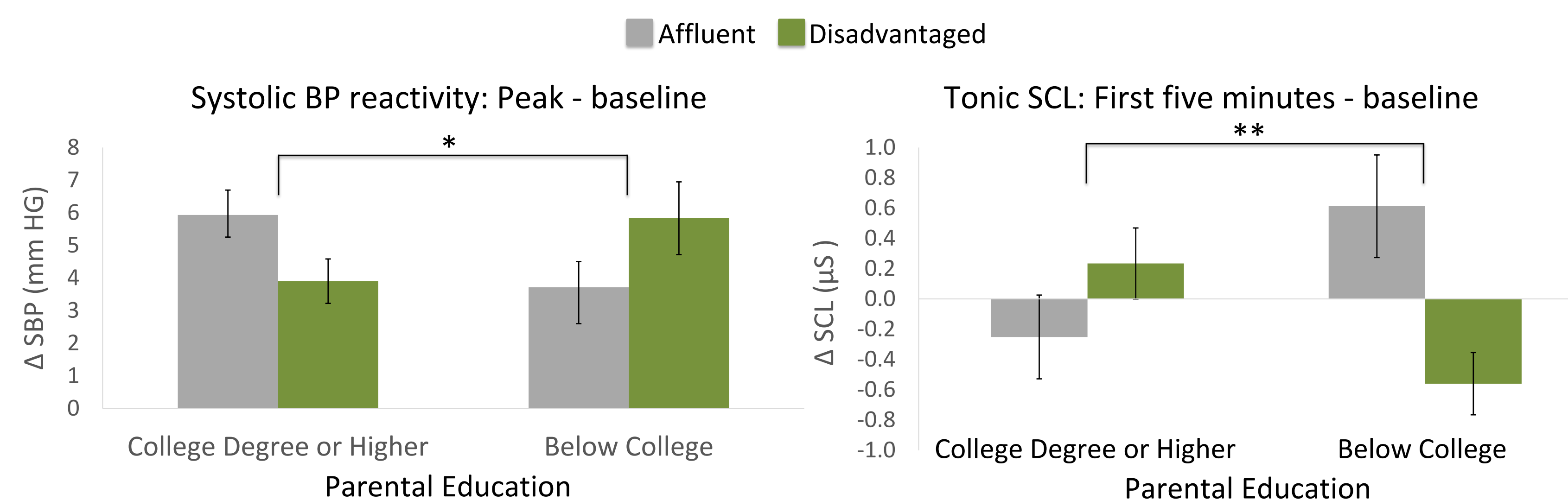
\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

- Emotional valence:

- Two Factors: Positive (amusement, enthusiasm and happiness) and negative (anger, fear and sadness)

## Results: Physiological Reactivity

- No main effects of neighborhood type on Systolic BP (SBP), Diastolic BP (DBP), skin conductance level (SCL), or non-specific skin conductance responses (nSCR)
- SCL analyses focus on first 5 minutes (SCL exhibits recovery prior to task completion)
- **Significant interactions between parental education and SBP, SCL and nSCR (all  $ps < 0.02$ )**



\*  $p < .05$ , \*\*  $p < .01$

## Summary

- Using VR to model neighborhood conditions is technically and conceptually feasible.
- Neighborhoods are perceived as distinct and reflective of disadvantage and affluence, varying in congruence with observations of neighborhoods differing in SES.
- Neighborhood disadvantage elicits more negative and less positive emotions.
  - Compassion is also increased when participants are exposed to greater disadvantage.
- There are no main effects of neighborhood type on physiological reactivity.
  - The influence of neighborhood type depends on childhood SES, even in an advantaged sample.
  - This interaction is system-specific: Evidence for both habituation (SCL) and sensitization (BP).

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