

Title:

A Social fMRI: Integrating Mobile Technology, Social Network Analysis, and Ecological Momentary Assessment to Understand the Daily Lives of Adolescents

Theme:

Innovative Methods and Statistics

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Abstract:

The goal of this symposium is present a unique methodology that captures the mechanisms of the social ecology of adolescents generating rich data and imaging of their social and environmental determinants of health. Social Functional Mechanisms Relationship Imagining (fMRI), (Aharony, 2011) is a methodology that collects and combines psychological, behavioral, social, and spatial daily life data by integrating multiple technologies and methodologies. Recent technological and methodological advances provide the opportunity to examine these mechanisms in natural settings and in unprecedented detail. Utilizing mobile phone-based data collection, we collect automated location data (GPS & cell phone tower triangulation) and manually entered Ecological Momentary Assessment (EMA) data to assess the social and environmental determinants of health for 250 urban youth for two years. This unique data set is applied to developing system-level models of the co-evolution of substance use behaviors, peer affiliations, and the use and meaning of geographical space over time. We will present a highly contextually specific research approach that grounds social networks within the physical and social environment of adolescents' lives. We use EMA methodology to simultaneously assess situational contingencies (behaviors, emotions, evaluations, peers, and locations) on adolescent substance use in real time with teens for two years, beginning at ages 13 or 14. By combining sampled specific coordinate data of location with a series of standard surveys, this approach will integrate the personal, social, and environmental processes associated with initiation and escalation of substance use. We are modeling the evolution of risk and protective mechanisms affecting substance, constituting a necessary step for building scientifically driven preventive interventions.

This symposium will include three presentations covering the following themes: a) Design of an Interactive Text Messaging Platform for Adolescent Intervention; b) A Bipartite Dynamic Networks Approach to Place-Based Risk among Urban Adolescents; and c) Using Ecological Momentary Assessment to Capture Adolescents' Experiences. These presentations will focus on theory and practice about place-based understanding of risk, approaches toward ecological understanding of person-environment interactions, examples of work from diverse areas, using diverse methods attempting to incorporate these understandings into a single study design. Presentations will be followed by a nationally recognized discussant to review and reflect on presentations strengths and challenges for prevention science.

Specifically, the goals of this symposium are:

1. Provide exposure to current technological and methodological efforts in place-based prevention research
2. Identify problems and challenges in this area of research and articulate strategies to address these issues
3. Find commonalities and overlapping interests among SPR members

Abstract id# 20757

Design of an Interactive Text Messaging Platform for Adolescent Intervention

Abstract:

Interactive technology such as text messaging and other features of smart phones and feature phones provides an appealing way to conduct research with today's tech-savvy adolescents. This presentation introduces and describes the design of a computerized system for managing an interactive text

messaging platform that is suitable for teen research. Design decisions and high level approaches and their justifications will be presented along with lower level technical details of the software and server technology. The framework that was designed, implemented and deployed for this text-based approach relies on popular Linux, Apache, MySQL and PHP (LAMP) computer server technology and the Tropo Cloud-based platform for text-enabled applications, with design direction taken from several well-studied software engineering design patterns.

The web server that hosted the texting application software was configured using the widely-used LAMP configuration, which is designed for efficient and cost-effective web servers, enabling a wide variety of power web-based applications. The text-based software that drives our study was implemented in the PHP programming language, which is widely used for web-based application development. PHP was selected for its broad adoption, availability of example programs, and support within Tropo, the text messaging platform that was selected for this project. The server was configured to use a high level of security to insure that data integrity was maintained. The overall design of the text messaging software system was engineered using three well-known design patterns that describe the structural, behavioral and concurrency aspects of the system.

The Short Message Service (SMS), or text messaging service, component of the system was implemented using a commercial Cloud-based Application Programmer Interface (API) called Tropo. Tropo provides web-application developers an API for designing software that supports voice and SMS communication in a variety of popular programming languages. The Tropo system enables unlimited, free use of the text-messaging platform for web-applications during the development and testing phase and a cost-effective pricing structure during the production phase of a project.

Application design began with an algorithm definition phase, during which appropriate design patterns were identified and implemented and test programs were developed to experiment with the features of the Tropo platform. Subjects were entered into the study on a rolling basis, resulting in subjects being in various states of the study simultaneously. Text message sequences were sent over four days, during an individually approved time window. Message interactions were handled asynchronously based on individualized interactions with each subject, with all interactions captured in a transaction log for data redundancy and security purposes. Upon completion of the four day sequence, subjects were sent reminder text messages at days 23, 29 and 30 after they entered the study, encouraging them to complete an online follow-up survey.

Abstract id# 20758

A Bipartite Dynamic Networks Approach to Place-Based Risk Among Urban Adolescents

Abstract:

Exposure to peers who use alcohol and drugs is a known risk factor for subsequent use by adolescents. However, the context of this exposure is also important, including, for example, who else may be present, the sorts of activities that occur, substance availability, and individual variability in characterization of a location's riskiness. Using a bipartite graph framework, where the two classes of nodes are individual adolescents and urban locations, we present a mathematical framework that describes the interrelations over time between the substance use of individual adolescents and the characteristics of urban locations they spend time in. Because it is quantitative, this approach is amenable to theoretical analysis via simulation. Furthermore, suitable data may be used to estimate the model interrelationships quantitatively, with a variant of Snijders' Stochastic Actor-Based (SAB) modeling as implemented in the R software package *RSiena*. We provide results from a series of theoretical simulations based on our previous work, predicting escalation of individual drug and alcohol individual adolescents' outcomes on the basis of characteristics of their personal (ego-centered) networks and pattern of use of more and less risky urban locations, as well as characteristics of both the individuals and the locations they occupy. Preliminary SAB statistical models will also be presented, using early data from the recently-initiated research project the forms the core of this symposium.

Abstract id# 20760

Using Ecological Momentary Assessment to Capture Adolescents'

Abstract:

This presentation will describe the EMA methodology and results from our study on early adolescent peer affiliations, moods, perceptions of peers, and activities. Participants were 82 youths in the U.S. Northwest. Participating youth were assessed during several 1-week periods in the fall, winter, and spring of 7th grade and in the fall of 8th grade. Participants were prompted to complete the EMA surveys 27 random times during the week-long assessment period when school was not in session, answering questions about who they were with, what they were doing, their mood and perception of their peers who were present, and where they were. The aim of this EMA protocol is to pinpoint risk and protective mechanisms for adolescents by understanding the social contexts and emotional responses to those situations.

Our findings demonstrate an increase in risky contexts. Adult monitoring decreased significantly over time ($\beta = -4.7, p < .001$) across the three waves of data during 7th grade for all participants. Being "out and about" increased significantly and unconditionally over all three waves ($\beta = 1.67, p < .01$). We also found that peer characteristics and behaviors were associated with mood. Happiness was moderately associated with being with peers perceived to be popular. Being with peers from whom they received frequent teasing or name calling was associated with sadness, anxiety, and feelings of being left out. We also explored social contexts, mood, and activities, for example, middle school youth were more likely to report physical activity with peers than when alone ($t = 5.03, p = .001$) and physical activity was also associated with happier mood ($t = 2.27, p = .026$). These data illustrate the unique findings that EMA methodology can provide. We also connected the EMA data with social network data to examine how perceptions of peer acceptance predicted affiliations with deviant peers. The peer social network data indicated that being with popular peers was associated with decline in deviant peer affiliation for both boys and girls. We will discuss future directions in a current study connecting the EMA data to that of other methodologies, such as social network, questionnaire, and location data.