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Concept Paper Form

Provisional Paper Title: Do Childhood Environments Offset Early Risks for Antisocial Behavior?
Proposing Author: Ryan Motz (School of Criminal Justice, University of Cincinnati)
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P.I. Sponsor: Terrie Moffitt (if the proposing author is a student or colleague of an original PI)
Today's Date: 1/22/2020

Please describe your proposal in 2-3 pages with sufficient detail for helpful review.

Objective of the study:

Abstract of the Idea

Within any population there is a small group of individuals who display chronic and persistent antisocial behavior that starts in childhood and continues into adulthood (Moffitt, 1993). Labeled life-course persistent (LCP) offenders, these individuals are hypothesized to express temperamental and neuropsychological challenges in early childhood that go on to set a course of person-environment interactions that lead to the continuity of problematic behavior through a process of compounding risks. Although many individuals experience early cognitive and behavioral risks, research shows that most children who experience early risk factors will not demonstrate such behavior in later stages of the life course (Robins, 1978). This raises an important question that research has yet to fully address: why do some people who have a high risk of LCP offending end up not turning into an LCP offender?

We aim to assess the Dunedin data to answer that question. In order to assess LCP offending "risk", we propose to use a polygenic score (PGS) that previous research has shown is associated with LCP offending (see Wertz et al., 2018)—the PGS for educational attainment (Lee et al., 2018). Once we identify those "at risk" of LCP offending based on the PGS, the primary goal of the study is to identify the early childhood and adolescent socio-environmental factors that may have offset the risk imparted by the PGS. Specifically, we hope to identify environments that help protect or compensate for a heightened propensity for LCP offending.

Proposed Steps for the Analysis

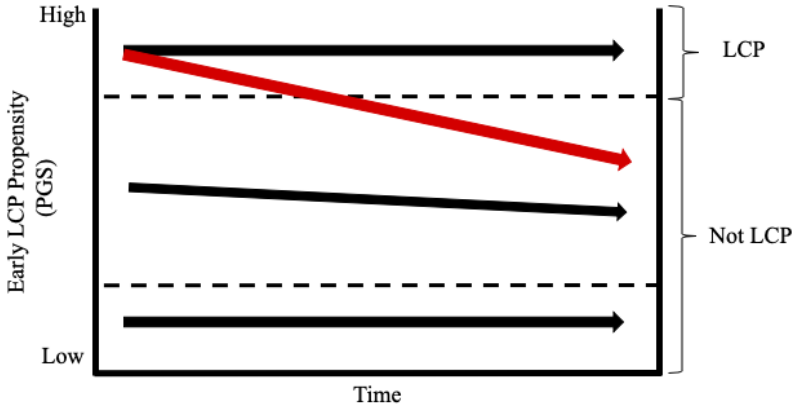
1. A genome-wide polygenic score will be used to measure propensity for falling along the LCP trajectory. Since PGSs are derived from one's genome and the genome is established at conception, a PGS can be viewed as an individual's earliest risk factor for following an LCP trajectory. By using a PGS as our measure of risk, we are using a measure of individual risk that is set before exposure to any environmental inputs. Therefore, our estimates of the impact of early environments will be not be biased by selection effects/individual differences, which has represented a potential limitation of previous research in the resilience/protective factor literature. We propose to use a polygenic score derived from the most recent educational attainment GWAS (Lee et al., 2018) as the risk measure.

2. The first step of the analysis will be to demonstrate that the PGS predicts membership in the LCP group (Odgers et al., 2007; Odgers et al., 2008). Additionally, we will assess whether the PGS predicts criminal record, timing to first conviction, and violent behavior. This will represent an update to Wertz and colleagues (2018) who relied on an earlier version of the PGS.

3. After demonstrating the PGS is associated with LCP grouping/behavior, the next step is to establish a cutoff for identifying those who are at risk for becoming an LCP based on their PGS score. This cutoff could be, for example, the median. However, we will conduct several analyses with various cutoffs that might be considered clinically relevant.
    a. The cutoff provides the ability to use the PGS to discriminate between cases that are at risk of being classified in the LCP subtype.
    b. This will allow us to identify individuals who have been <u>incorrectly</u> classified by the PGS. In other words, our primary focus will be on the <u>false-positives</u>. (i.e., those who are high on genetic "risk", but who did not develop into an LCP). This group is shown in Figure 1 with the red arrow.

4. After identifying the false-positives, we will seek to identify the environmental factors that may have promoted prosocial behavior among this group that has a high genetic potential to display antisocial behavior.
    a. We will focus on early-in-life environments (e.g., from birth to Phase 13 or 15).
    b. It will be of interest to determine if the promotive effects of environmental factors are qualitative (i.e., specific environments are necessary to promote prosocial behavior) or quantitative (i.e., the specific environments do not matter as much as the sheer number of promotive environmental factors).

Figure 1. Primary focus is on the false-positives: high early LCP propensity, but not of LCP subtype.



Data analysis methods:

This analysis may be carried out with various descriptive, bivariate, and multivariate analyses as appropriate. The statistical sophistication will not be the goal. Rather, the goal will be to substantively identify potential protective/compensating factors.

Variables needed at which ages:

Concept	Variable
Demographics	Sex
EA Polygenic Score	Residualized standardized polygenic score for educational attainments (Lee et al., 2018)
Antisocial/Criminal Behavior	Criminal Records/Dated Convictions Data (same that Barnes used for perceptions paper) - Age at first conviction - Any conviction - Number of convictions
	Trajectories of antisocial behavior between ages 7-26 (from Odgers et al., 2008)
	Self-reported Crime and delinquency (P15-38)
Socio-Environmental Factors	Childhood SES background

	Parent age at first birth
	Parental Attitude Research Instrument
	Family Relations Index of the Family Environment Scales
	Composite variables of parenting (from Belsky et al., 2005) - Early childhood - Mid childhood - Early adolescence
	Overall measure of positive experienced-parenting in childhood (from Wertz et al., 2019)
	Discipline strategies questionnaire – Honalee can you advise the best variables?
	Parent mental health
	Family structure/functioning
	Maltreatment
	Attachment to, activities with peers (P5-15)
	Foetal/newborn perinatal health? – Honalee can you advise the best variables?

Significance of the Study (for theory, research methods or clinical practice):

The field of criminology has traditionally focused on risk-based explanatory models of why individuals commit crime. Recently, a literature base with a focus on resiliency and factors that protect against the development of violence has emerged (Hall et al., 2012; Ttofi et al., 2016). Such focus, however, has yet to be applied to the explanation of LCP/non-LCP offending trajectory. Additionally, many studies that currently exist fail to account for the heterogeneity of early risks for antisocial behavior that individuals begin life with. By not accounting for these individual differences, our current understanding of important protective and compensating factors may be biased.

We view this project as being important to the field of criminology for reasons related to both theory and methods. When it comes to theory, we seek to further our understanding of LCP development by exploring whether early socio-environmental factors can derail an individual from

an LCP trajectory (something that has yet to be investigated).

When it comes to methods, we propose to use information gleaned from the genome to help account for individual differences that are set at conception. Biosocial criminologists often claim that a genetically sensitive approach is the most appropriate method to identify environmental causal factors underlying human behavior. To date, however, few have been able to perform analyses that would actually sort out those influences. The availability of high-powered polygenic scores makes it possible for us to perform a genetically-informed analysis that is truly environmentally focused.

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Data Security Agreement

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☒	I am current on Human Subjects Training (CITI (www.citiprogram.org) or equivalent)
☒	My project is covered by the Duke ethics committee OR I have /will obtain ethical approval from my home institution.
☒	I will treat all data as "restricted" and store in a secure fashion. My computer or laptop is: a) encrypted (recommended programs are FileVault2 for Macs, and Bitlocker for Windows machines) b) password-protected c) configured to lock-out after 15 minutes of inactivity AND d) has an antivirus client installed as well as being patched regularly.
☒	I will not "sync" the data to a mobile device.
☒	In the event that my laptop with data on it is lost, stolen or hacked, I will immediately contact Moffitt or Caspi.
☒	I will not share the data with anyone, including my students or other collaborators not specifically listed on this concept paper.
☒	I will not post data online or submit the data file to a journal for them to post. *Some journals are now requesting the data file as part of the manuscript submission process. Study participants have not given informed consent for unrestricted open access, so we have a managed-access process. Speak to Temi or Avshalom for strategies for achieving compliance with data-sharing policies of journals.*
☒	I will delete all data files from my computer after the project is complete. Collaborators and trainees may not take a data file away from the office. This data remains the property of the Study and cannot be used for further analyses without an approved concept paper for new analyses.

Signature: