

**ENVIRONMENTAL-RISK (E-RISK) LONGITUDINAL TWIN STUDY
CONCEPT PAPER FORM**

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Provisional Paper Title: Deliberate self-harm and violent criminality in adolescence: Results from a genetically-informative, longitudinal cohort study

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Objective of the study and its significance:

Deliberate self-harm is the act of inflicting harm on oneself through the destruction of body tissue (e.g., cutting or burning oneself), ingestion of toxic substances, or other intentional acts (Madge et al., 2008). Deliberate self-harm can include acts performed with the intent to kill oneself, as well as behaviors performed without suicidal intent (e.g., for the purpose of negative emotion regulation; Nock et al., 2009). Self-harm has been identified as an important risk factor for completed suicide (e.g., Olfson et al., 2017; Tidemalm et al., 2015) and represents a significant public health concern.

Self-harm has been linked with aggressive behavior (see O'Donnell et al., 2015 for a systematic review), as well as disorders associated with violent crime (e.g., borderline personality disorder and antisocial personality disorder; Ayodeji et al., 2015; Newhill et al., 2009; Scott et al., 2014). These relations suggest that self-harm may serve as a marker of an underlying vulnerability to emotional and behavioral dysregulation, which contributes to both internalized and externalized violence. Two recent studies, conducted using population-based registry data, have provided support for this theory. Webb and colleagues (2017) observed an increased risk for self-harm and violent offending (analyzed independently) among individuals hospitalized for self-harm and interpersonal violence during childhood. Sahlin and colleagues (2017) obtained a robust association between self-harm and violent criminality that persisted after adjusting for psychiatric comorbidities and socioeconomic status.

These studies have shown that deliberate self-harm and violent criminality are associated. However, the factors that predict engagement in both self-harm and violent offending and explain the overlap between these outcomes remain largely unexplored. Identifying risk factors for both self-harm and violent criminal behavior can help to (a) inform etiologic models of these outcomes and their co-occurrence, and (b) guide the development of appropriate assessment and treatment strategies.

This study has three primary aims:

- 1) Identify preadolescent risk factors for self-harm and violent criminality in adolescence.
- 2) Quantify the genetic and environmental overlap between self-harm and violent criminality in adolescence.
- 3) Characterize this population's psychiatric correlates, personality traits, and risk for victimization.

The E-Risk design lends itself well to accomplishing these aims. First, it is prospective, enabling assessment of the antecedents of self-harm and criminal behavior. Second, participants' self-harm behaviors were assessed at age 12 (by maternal report) and age 18 (by self-report), which captures the age period (12-14) when self-harm typically debuts. Lastly, as these data consist of identical and fraternal twin pairs, we can quantify the genetic and environmental influences on both self-harm and violent criminality.

The present study builds on prior analyses in several other important ways. First, we will employ both self-reports and official police records of violent criminal behaviors, capturing a wider range of criminal acts than conviction data alone. Second, we will differentiate between self-harm acts performed with and without suicidal intent. Third, we will examine the effect of repeated compared with infrequent self-harm behaviors. Lastly, we will extend beyond assessment of psychiatric correlates to also examine personality features and experiences of victimization.

Statistical analyses:

Coding of primary outcome variables:

Deliberate self-harm will be treated as a binary variable. Individuals will be coded as positive if they report having engaged in any self-harm between ages 12-18.

Violent crime will be treated as a binary variable. For primary analyses, individuals will be coded as positive if they (a) have at least one official police record of a violent offense, and/or (b) endorse two or more violent criminal behaviors via self-report at age 18. For sensitivity analyses conducted using only official record data (see below), individuals will be coded as positive if they have at least one official record of a violent offense at age 18.

To determine the relative risk associated with engaging in both self-harm and violent crime, a variable with three categories/groups will be created. The three groups will consist of: (1) individuals coded as negative for both self-harm and violent crime, (2) individuals coded as positive for self-harm and negative for violent crime, and (3) individuals coded as positive for both self-harm and violent crime.

Step 1. Replicate prior findings (e.g., Sahlin et al., 2017) that self-harm and violent crime are associated. Logistic regression will be used to test for an association between self-harm and violent crime.

Step 2. Test associations between preadolescent risk factors and self-harm and violent criminality in adolescence.

We will analyze five theoretically-driven risk factors assessed at age 12:

- 1) Family history of psychiatric disorder
- 2) Family history of suicide
- 3) Childhood maltreatment
- 4) Low childhood self-control
- 5) Self-harm behavior
 - a. We will also include self-harm behavior assessed at age 10.

Means (for continuous measures) and prevalences (for binary measures) will be calculated for each self-harm/violent crime group. Multinomial logistic regression will be used to test whether each risk factor (a) predicts engagement in both self-harm and violent crime in adolescence, and (b) distinguishes this group from the two comparison groups.

Step 3. Characterize the correlates of self-harm and violent offending in adolescence.

All correlates were assessed at age 18. We will analyze theoretically-driven measures in the following domains:

- 1) Psychiatric correlates, including PTSD, psychosis, depression, and conduct disorder
- 2) Personality correlates (five-factor dimensions), as reported by individuals who know the study members well
- 3) Risk for victimization: We will examine crime victimization specifically, as well as a summary measure of victimization experiences.

Means (for continuous measures) and prevalences (for binary measures) will be calculated for each self-harm/violent crime group. Multinomial logistic regression will be used to test whether each correlate (a) is associated with engagement in both self-harm and violent crime in adolescence, and (b) distinguishes this group from the two comparison groups.

Step 4. Quantify the genetic and environmental overlap between self-harm and violent offending in adolescence.

Univariate twin modeling will be used to quantify the genetic and environmental influences on self-harm and violent criminality. Bivariate twin modeling will be used to calculate the genetic and environmental correlations between these outcomes.

Step 5. Conduct sensitivity analyses.

Note: Although we would like to conduct all of these analyses, some may not be possible due to sample size constraints.

To determine whether effects are driven by a small group of individuals engaging in very severe forms of self-harm, we will test the association between self-harm and violent crime across different levels of (a) suicidal intent and (b) lethality.

To determine whether effects are driven by individuals engaging in repeated self-harm, we will test the association between self-harm and violent crime across different frequencies of self-harm behavior.

Because self-reports of criminal behavior may be subject to bias, we will replicate primary analyses using only the crime data from official records.

Note:

All regression models will account for the non-independence of twin observations. Survey analysis procedures will be used and the data will be treated as clustered, with the family number for each twin pair specified as the clustering variable.

Participant SES and sex will be included as covariates in all models.

Described above are the primary, pre-planned analyses. Secondary analyses may be added as suggested through internal review and will be identified as secondary in the manuscript.

Variables Needed at Which Ages (names and labels):

Study: E-Risk

Phase	Variables	Description
5	Identifiers and background	
	familyid	Family number of twin pair
	atwinid	Twin A ID number
	btwinid	Twin B ID number
	sampsex	Sex of participant
	sesw	SES continuous variable
	zygosity	Zygosity - Current from October 2016

Preadolescent risk factors		
10	pe116m10	Deliberately harms self or attempts suicide
12	sharmsuice12	Self-harm behavior
	harme512	Maltreatment between ages 5-12
	LOWSC510E	Low childhood self-control between ages 5-10

	fhanypm12	Proportion of twin's family members with valid data who have any disorder
	fhsuipm12	Proportion of twin's family members with valid data who have attempted suicide
	fhsuireed12	Strong family history of suicide, Reeds score, >=80th percentile (Belsky 2012)

18	Self-harm	
	sharme18	Self-harm (elder twin)
	sharmy18	Self-harm (younger twin)
	suicate18	Suicide attempt (elder twin)
	suicaty18	Suicide attempt (younger twin)
	SH3	Cut or stabbed self
	SH3a	Number of times [cut or stabbed self]
	SH3b	Suicidal intent [when cut or stabbed self]
	SH3c	Required medical treatment [after cut or stabbed self]
	SH4	Overdosed on pills
	SH4a	Number of times [overdosed on pills]
	SH4b	Suicidal intent [when overdosed on pills]
	SH4c	Required medical treatment [after overdosed on pills]
	SH5	Took some poison
	SH5a	Number of times [took some poison]
	SH5b	Suicidal intent [when took some poison]
	SH5c	Required medical treatment [after took some poison]
	SH6	Tried to gas self
	SH6a	Number of times [tried to gas self]
	SH6b	Suicidal intent [when tried to gas self]
	SH6c	Required medical treatment [after tried to gas self]
	SH7	Tried to hang (or strangle) self
	SH7a	Number of times [tried to hang or strangle self]
	SH7b	Suicidal intent [when tried to hang or strangle self]
	SH7c	Required medical treatment [after tried to hang or strangle self]
	SH8	Tried to shoot self
	SH8a	Number of times [tried to shoot self]
	SH8b	Suicidal intent [when tried to shoot self]
	SH8c	Required medical treatment [after tried to shoot self]
	SH9	Tried to drown self
	SH9a	Number of times [tried to drown self]
	SH9b	Suicidal intent [when tried to drown self]
	SH9c	Required medical treatment [after tried to drown self]
	SH10	Jumped from a high place
	SH10a	Number of times [jumped from a high place]
	SH10b	Suicidal intent [when jumped from a high place]
	SH10c	Required medical treatment [after jumped from a high place]
	SH11	Crashed a car or motorcycle on purpose

	SH11a	Number of times [crashed a car or motorcycle on purpose]
	SH11b	Suicidal intent [when crashed a car or motorcycle on purpose]
	SH11c	Required medical treatment [after crashed a car or motorcycle on purpose]
	SH12	Burned self on purpose
	SH12a	Number of times [burned self on purpose]
	SH12b	Suicidal intent [when burned self on purpose]
	SH12c	Required medical treatment [after burned self on purpose]
	SH13	Hurt self in any other way
	SH13a	Number of times [hurt self in any other way]
	SH13b	Suicidal intent [when hurt self in any other way]
	SH13c	Required medical treatment [after hurt self in any other way]

**These detailed self-harm items will be used to assess the lethality and suicidal intent of participants' self-harm behaviors, as well as the frequency of the behaviors.*

Violent criminal behavior		
	Self-report violent criminal behavior: computer questionnaire (elder twin)	cd1e18, cd2e18, cd3e18, cd4e18, cd5e18, cd6e18, cd7e18, cd8e18, cd9e18, cd10e18, cd34e18, cd38e18
	Self-report violent criminal behavior: computer questionnaire (younger twin)	cd1y18, cd2y18, cd3y18, cd4y18, cd5y18, cd6y18, cd7y18, cd8y18, cd9y18, cd10y18, cd34y18, cd38y18
	anyviole18	Any violent crime (official police record; elder twin)
	anyvioly18	Any violent crime (official police record; younger twin)
Victimization		
	POLYVCTZE18	Poly-victimization count between ages 12-18
	POLYVCTZCE18	Poly-victimization, 4 categories (0, 1, 2, 3+)
	VCTZCONE18	Conventional victimization count between ages 12-18
	VCTZDICONE18	Conventional victimization severity, 2 categories (0/1/2/3, 4/5)
Mental health		
	PTSD symptom scale (not yet computed)	PTSD symptom count
	dxptsdcue18	Current PTSD diagnosis, DSM-IV
	MDESXE18	Major depression symptom count
	dxmdee18	Major depressive episode, DSM-IV
	PSYSYMPE18	Psychosis symptom count
	psysymp01e12	Psychosis symptom count (0, 1 or more)
	CDSXE18	Conduct disorder symptom count
	cdmode18	Moderate conduct disorder
Personality		
	BFIOCO1E18	Openness to experience: co-informant 1 report
	BFICCO1E18	Conscientiousness: co-informant 1 report

	BFIECO1E18	Extraversion: co-informant 1 report
	BFIACO1E18	Agreeableness: co-informant 1 report
	BFINCO1E18	Neuroticism: co-informant 1 report
	BFIOCO2E18	Openness to experience: co-informant 2 report
	BFICCO2E18	Conscientiousness: co-informant 2 report
	BFIECO2E18	Extraversion: co-informant 2 report
	BFIACO2E18	Agreeableness: co-informant 2 report
	BFINCO2E18	Neuroticism: co-informant 2 report

References cited:

- Ayodeji, E., Green, J., Roberts, C., Trainor, G., Rothwell, J., Woodham, A., & Wood, A. (2015). The influence of personality disorder on outcome in adolescent self-harm. *The British Journal of Psychiatry, 207*, 313-319.
- Madge, N., Hewitt, A., Hawton, K., Jan de Wilde, E., Corcoran, P., Fekete., S., . . . Ystgaard, M. (2008). Deliberate self-harm within and international community sample of young people: Comparative findings from the Child & Adolescent Self-harm in Europe (CASE) Study. *Journal of Child Psychology and Psychiatry, 49*, 667-677.
- Newhill, C.E., Eack, S.M., & Mulvey, E.P. (2009). Violent behavior in borderline personality. *Journal of Personality Disorders, 23*, 541-554.
- Nock, M.K., Prinstein, M.J., & Sterba, S.K. (2009). Revealing the form and function of self-injurious thoughts and behaviors: A real-time ecological assessment study among adolescents and young adults. *Journal of Abnormal Psychology, 118*, 816-827.
- O'Donnell, O., House, A., & Waterman, M. (2015). The co-occurrence of aggression and self-harm: Systematic literature review. *Journal of Affective Disorders, 175*, 325-350.
- Olfson, M., Wall, M., Wang, S., Crystal, S., Gerhard, T., & Blanco, C. (2017). Suicide following deliberate self-harm. *American Journal of Psychiatry*. Advance online publication.
- Sahlin, H., Kuja-Halkola, R., Bjureberg, J., Lichtenstein, P., Molero, Y., Rydell, M., . . . Hellner, C. (2017). Association between deliberate self-harm and violent criminality. *JAMA Psychiatry, 74*, 615-621.
- Scott, L.N., Stepp, S.D., & Pilkonis, P.A. (2014). Prospective associations between features of borderline personality disorder, emotion dysregulation, and aggression. *Personality Disorders, 5*, 278-288.
- Tidemalm, D., Beckman, K., Dahlin, M., Vaez, M., Lichtenstein, P., Långström, N., & Runeson, B. (2015). Age-specific suicide mortality following non-fatal self-harm: National cohort study in Sweden. *Psychological Medicine, 45*, 1699-1707.
- Webb, R.T., Antonsen, S., Carr, M.J., Appleby, L., Pedersen, C.B., & Mok, P.L.H. (2017). Self-harm and violent criminality among young people who experienced trauma-related hospital admission during childhood: A Danish national cohort study. *Lancet Public Health*. Advance online publication.

Data Security Agreement

Provisional Paper Title	Deliberate self-harm and violent criminality in adolescence: Results from a genetically-informative, longitudinal cohort study
Proposing Author	Leah Richmond-Rakerd
Today's Date	July 5, 2017

Please keep one copy for your records

(Please initial your agreement)

- LR I am current on Human Subjects Training (CITI (www.citiprogram.org) or training in human subject protection through my post or courses.
- LR My project is covered by Duke or King's IRB OR I have /will obtain IRB approval from my home institution.
- LR I will treat all data as "restricted" and store in a secure fashion.
- LR I will not share the data with anyone, including students or other collaborators not specifically listed on this concept paper.
- LR 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. The E-Risk Study cannot be shared because the Study Members have not given informed consent for unrestricted open access. Speak to Terrie or Avshalom for strategies for dealing with data sharing requests from Journals.
- LR Before submitting my paper to a journal, I will submit my draft manuscript and scripts for data checking, and my draft manuscript for co-author mock review, allowing three weeks.
- LR I will submit analysis scripts and new variable documentation to project data manager after manuscript gets accepted for publication.
- LR I will return all data files to the Data Manager after the project is complete. Collaborators and graduates of DPPP may not take a data file away from the DPPP office. The data remains the property of the Study and cannot be used for further analyses without express, written permission.
- LR I will ensure geographical location information, including postcodes or geographical coordinates for the E-Risk study member's homes or schools, is never combined or stored with any other E-Risk data (family or twin-level data)

Signature:L. Richmond-Rakerd.....

CONCEPT PAPER RESPONSE FORM

A. To be completed by the proposing author

Proposing Author:

√ I have read the E-Risk data-sharing policy guidelines and agree to follow them

Provisional Paper Title: Deliberate self-harm and violent criminality in adolescence: Results from a genetically-informative, longitudinal cohort study

Potential co-authors: Jasmin Wertz, Jessie Baldwin, Andrea Danese, Louise Arseneault

Potential Journals: Journals in developmental psychology or psychiatry

Intended Submission Date (month/year): January 2018

Please keep one copy for your records and return one to Louise (louise.arseneault@kcl.ac.uk)

B. To be completed by potential co-authors:

Approved Not Approved Let's discuss, I have concerns

Comments:

Please check your contribution(s) for authorship:

- Conceptualizing and designing the longitudinal study
- Conceptualizing and collecting one or more variables
- Data collection
- Conceptualizing and designing this specific paper project
- Statistical analyses
- Writing
- Reviewing manuscript drafts
- Final approval before submission for publication
- Acknowledgment only, I will not be a co-author

Signature: