

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

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Proposed co-authors: Dunedin co-investigators, Terrie Moffitt, Richie Poulton

Provisional Paper Title: Identifying a cut-off score for clinically-meaningful loneliness on the 3-item UCLA Loneliness Scale.

Date: 6 February 2020 (Updated 15 April 2021)

Objective of the study and its significance:

Loneliness is not a psychiatric disorder, and there is no consensus on a threshold at which a person is deemed to be 'lonely' versus 'non-lonely'. For this reason, it is typically treated as a continuum along with all people vary. Indeed, most people are likely to experience some degree of loneliness at some point in their lives, and to the extent that the experience resolves in due course, it is not necessarily pathological in its own right. Nonetheless, higher loneliness is associated with an increased risk for mental health problems such as depression and anxiety, with a 1 standard deviation increase in loneliness more than doubling the odds of meeting diagnostic criteria for these disorders (Matthews et al, 2019). There may therefore be a certain level of severity at which feelings of loneliness could be a cause for concern to clinicians, caregivers or educators.

Moreover, loneliness is independently associated with a diverse range of mental health problems, including not only depression and anxiety, but also ADHD, conduct disorder, self-harm, suicidality and service use (Matthews et al, 2019). These associations remain even when controlling for the comorbidity of these problems. Loneliness could therefore be a valuable risk indicator for psychopathology in general, analogous to sleep problems or difficulty concentrating, which are present in a number of different disorders and are therefore included in widely-used screening checklists. This suggests potential utility of a loneliness measure as an additional screening tool for generalised risk of mental health problems. Again, however, there is a need to discriminate more mundane levels of loneliness that do not warrant clinical attention from more severe levels that may signal risk for mental disorders.

The 3-item short form of the UCLA Loneliness Scale developed by Hughes et al (2004) is among the most well-known and widely-used measures of loneliness. It has sound psychometric properties and is correlated strongly with the full UCLA Scale. Its brevity and ease of use makes it ideal for assessing loneliness in large surveys, and for this reason it has the potential to be administered as a quick screening tool. The items ask "How often do you feel... (1) That you lack companionship? (2) Feel left out? (3) Feel isolated from others?" Items are scored "hardly ever" (1), "sometimes" (2) and "often" (3), and summed to produce a scale from 3 to 9.

The aim of this project is to identify a cut-off score on this brief, widely-used and well-validated loneliness measure that could be used to identify individuals at elevated risk for mental health problems. Such a cut-off score could have applications both in research, to establish a method of categorising individuals as

lonely which can be replicated across studies; and in primary care or education settings, as part of a screening battery.

Statistical analyses:

Using ROC curve analysis, I will estimate how accurately the short form UCLA scale can discriminate between people with and without a mental health problem, denoted by the area under the curve (AUC) statistic. The specific class variables to be selected for analysis are DSM-5 diagnoses of depression and anxiety, presence of self-harm or suicidal behaviours, and use of services for a mental health problem. These will also be combined to create a composite 'any mental health problem' class variable.

Given that the scale consists only of three items, and is not specifically designed to assess psychiatric disorders, it is anticipated that the area under the curve (AUC) will be modest in size, but sufficiently greater than chance to suggest that loneliness scores can be clinically informative. By examining the sensitivity, specificity, and positive predictive values, I will identify a cut-point that identifies a substantial number of individuals who have a mental health problem, while keeping the false positive rate low.

As a follow-up analysis, I will test whether the use of extra criteria (e.g. additional items, corroboration by informant report, history of loneliness in childhood) can be used improve the diagnostic accuracy of the scale.

Variables Needed at Which Ages (names and labels):

Study: E-Risk

Age 12:

lonelye12 Loneliness age 12

Age 18:

Derived variables:

dxmdee18 MDE diagnosis

dxgade18 GAD diagnosis

sharme18 Self harm

suicate18 Suicide attempt

Item-level variables:

ctss1e18 Loneliness item 1

ctss2e18 Loneliness item 2

ctss3e18 Loneliness item 3

ctss3e18 Loneliness item 4

ctss3e18 Loneliness item 5

ser1e18 Service use – GP

ser2e18 Service use – Counsellor

ser4e18 Service use – Psychiatrist

bp86e18 Has trouble making friends (coder impressions)

bp87e18 Feels that no one loves them (coder impressions)

bp88e18 Seems lonely (coder impressions)

inf49e18 Has trouble making friends (co-informants)

inf50e18 Feels that no one loves them (co-informants)

inf51e18 Seems lonely (co-informants)

**Study: Dunedin**

**Phase 38:**

**Derived variables:**

dxmde38 Major depressive episode, dsm4, p38

dxgad38 Gen Anxiety Disorder, DSM4\_6mth duration, phase38

Self-harm – unsure of name, can't find on D-Dict. Same questionnaire as P18 E-Risk though

EverAttSuic38 Sm has attempted suicide, ph38 (feb 2013). I believe this is lifetime

PSQI38 Pitt Sleep (poor) Quality Index at 38

LifSat38 Satisfaction with life scale, p38 (aka 'well-being')

Lonely38 Often feels lonely, isolated at 38

inSol38 SM is socially isolated - inf report, age 38

**Items:**

Loneliness items: ssl1p38, ssl2p38, ssl3p38, ssl4p38, ssl5p38

Service use items: ser1p38, ser2p38, ser4p38

Informant Isolation items: in49av38 in50av38 in51av38

**Phase 45:**

**Derived variables:**

dxmde45 Major depressive episode, dsm4, p45

dxgad45 Gen Anxiety Disorder, DSM4\_6mth duration, phase45

Self-harm – unsure of name, can't find on D-Dict. Same questionnaire as P18 E-Risk though

EverAttSuic45 Sm has attempted suicide, ph45 (feb 2013). I believe this is lifetime

PSQI45 Pitt Sleep (poor) Quality Index at 45

LifSat45 Satisfaction with life scale, p45 (aka 'well-being')

Lonely45 Often feels lonely, isolated at 45

inSol45 SM is socially isolated - inf report, age 45

**Items:**

Loneliness items: ssl1p45, ssl2p45, ssl3p45, ssl4p45, ssl5p45

Service use items: ser1p45, ser2p45, ser4p45

Informant Isolation items: in49av45 in50av45 in51av45

References cited:

Hughes, M. E., Waite, L. K., Hawkley, L. C., & Cacioppo, J. T. (2004). A short scale for measuring loneliness in large surveys. *Research Into Aging, 26*(6), 655-672.

Matthews, T., Danese, A., Caspi, A., Fisher, H. L., Goldman-Mellor, S., Kopa, A., Moffitt, T. E., Odgers, C. L., & Arseneault, L. (2019). Lonely young adults in modern Britain: findings from an epidemiological cohort study. *Psychological Medicine, 49*(2), 268-277.

## Data Security Agreement

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Proposing Author	Timothy Matthews
Today's Date	6 Feb 2020 (Updated 15 April 2021)

### **Please keep one copy for your records**

(Please initial your agreement)

- TM I am familiar with the King's College London research ethics guidelines (<https://www.kcl.ac.uk/innovation/research/support/ethics/about/index.aspx>) and the MRC good research practice guidelines (<https://www.mrc.ac.uk/research/policies-and-guidance-for-researchers/good-research-practice/>).
- TM My project has ethical approval from my institution.
- TM I am familiar with the EU General Data Protection Regulation (<https://mrc.ukri.org/documents/pdf/gdpr-guidance-note-3-consent-in-research-and-confidentiality/>), and will use the data in a manner compliant with its requirements.
- TM My computer is (a) encrypted at the hard drive level, (b) password-protected, (c) configured to lock after 15 minutes of inactivity, AND (d) has an antivirus client which is updated regularly.
- TM I will treat all data as "restricted" and store in a secure fashion.
- TM I will not share the data with anyone, including students or other collaborators not specifically listed on this concept paper.
- TM I will not merge data from different files or sources, except where approval has been given by the PI.
- TM 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 the study PI for strategies for dealing with data sharing requests from Journals.
- TM 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.
- TM I will submit analysis scripts and new variable documentation to project data manager after the manuscript gets accepted for publication.
- TM I will delete the data after the project is complete.
- TM **For projects using location data:** 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)
- TM **For projects using genomic data:** I will only use the SNP and/or 450K data in conjunction with the phenotypes that have been approved for use in this project at the concept paper stage.

Signature: 