

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

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Provisional Paper Title: Adolescent loneliness, social isolation, and perceptions of social status and career prospects

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Objective of the study and its significance:

Loneliness is an indiscriminate phenomenon that affects people from diverse socioeconomic backgrounds. However, it is particularly prevalent among young people. Adolescents and young adults who experience loneliness are more likely to struggle with their mental health daily functioning. Moreover, they are less confident in the workplace, less optimistic about their career prospects, and more likely to be out of work at school-leaving age (Matthews et al, 2019a). Evidence also suggests that those who experience loneliness in childhood leave school with lower qualifications (Matthews et al, 2022), suggesting that even though loneliness does not discriminate by social class, it could be a force for downward social mobility.

Loneliness is an emotional state that represents people's own perceptions of their social relationships - specifically, perceptions of shortcomings in the quality or quantity of these relationships. It should be emphasised that these deficits are subjective and shaped by individuals' beliefs and expectations. In contrast, social isolation refers to a lack of social connection as defined by more objective criteria. For instance, individuals who have few friends and seldom spend time with others may be defined as socially isolated, regardless of whether they feel lonely. There is evidence that children who are socially isolated during the school years are more likely to experience academic difficulties and drop out of school early (Woodward and Ferguson, 2002).

Disentangling the effects of loneliness and social isolation has been complicated by the fact that these two constructs have frequently been investigated separately. Where they have been studied in parallel, loneliness has tended to be implicated in mental health problems, whilst social isolation appears to be more relevant for physical health and longevity (Matthews et al, 2016; Steptoe et al, 2013). However, no research has investigated which of these constructs is the 'active ingredient' in the association between deficits in social relationships and poorer employment and economic prospects.

A further issue when asking individuals about their perceived employability, career optimism and social status is that loneliness or social isolation could be sources of reporting bias. Loneliness in particular has been associated with greater pessimism (Cacioppo et al, 2006), which could negatively bias individuals' perceptions of their employability. This could ultimately become a self-fulfilling prophecy, by reducing individuals' inclination to seek desirable jobs or promotions.

Sibling and twin designs offer a means of testing whether the 'effects' of loneliness/isolation are accounted for by negatively-skewed perceptions. For instance, a study of neighbourhood characteristics found that lonelier individuals considered their neighbourhoods to be more troubled than their own siblings who lived at the same address (Matthews et al, 2019b). This principle can be applied to economic outcomes such as perceived social status or career optimism: if an adolescent who has experienced loneliness perceives their prospects to be poorer than a non-lonely sibling who shares the same level of education, employment status and family SES, this would suggest that loneliness is associated with negatively-biased perceptions, highlighting an important target for interventions.

The present study aims to investigate the following research questions:

1. Do lonely children feel more negatively about their economic and employment prospects as adults?
Associations between early adolescent loneliness/social isolation and perceived social status, perceived 'soft skills', and career optimism at age 18 will be examined. In the case of perceived social status, repeated measures between ages 12 and 18 allow for bidirectional associations to be tested.
2. Do isolated/lonely individuals have more negative perceptions compared to non-isolated/lonely individuals with comparable socioeconomic circumstances?
Sibling control methods using cohabiting twins will be used to further control for household socioeconomic status. Twin discordance in qualification levels and current employment status will also be controlled for.

Statistical analyses:

1. Linear models will be used to regress perceived social status, job market preparedness ('soft skills') and career optimism at age 18 first on age-12 loneliness and age-12 social isolation. Age-18 loneliness and isolation be entered into the model as a second step in each analysis, to test whether any effects detected at age 12 if loneliness is no longer ongoing at age 18.
2. In the case of perceived social status (the 'ladder task'), for which repeated measures are available, a cross-lagged model will be used to test bidirectional associations from age 12-18.
3. Fixed-effects models will be used to regress within-twin pair differences in the age-18 outcomes on within-pair differences in loneliness/isolation. This analysis will be limited to twins living in the same home, to hold the SES of the family household constant. Twin differences in qualifications and employment status will also be controlled for.

Variables Needed at Which Ages (names and labels):

Study:

Age 5:

sisoe5
sisoy5

Age 7:

sisoe7
sisoy7

Age 10:

sisoe10
sisoy10

Age 12:
sisoe12
sisoy12
lonelye12
sta04ec12
sta04yc12
cdie12
cdiy12
masce12
mascy12

Age 18:
socisoe18
socisoy18
lonelye18
lonelyy18
sicountry18
optime18
jprepae18
neete18
educachve18
mdesxe18
mdesxy18
gadsxe18
gadsxy18
cohabe18

References cited:

Cacioppo, J. T., Hawkley, L. C., Ernst, J. M., Burleson, M., Berntson, G. G., Nouriani, B., & Spiegel, D. (2006). Loneliness within a nomological net: An evolutionary perspective. *Journal of Research in Personality, 40*(6), 1054-1085.

Matthews, T., Danese, A., Wertz, J., Odgers, C., Ambler, A., Moffitt, T. E., & Arseneault L. (2016). Social isolation, loneliness and depression in young adulthood: A behavioural genetic analysis. *Social Psychiatry and Psychiatric Epidemiology, 51*(3), 339-348.

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

Matthews, T., Odgers, C. L., Danese, A., Fisher, H. L., Newbury, J., Caspi, A., Moffitt, T. E., & Arseneault, L. (2019b). Loneliness and neighbourhood characteristics: A multi-informant, nationally-representative study of young adults. *Psychological Science, 30*(5), 765-775.

Matthews, T., Qualter, P., Bryan, B. T., Caspi, A., Danese, A., Moffitt, T. E., Odgers, C. L., Strange, L., & Arseneault, L. (in press). The developmental course of loneliness in adolescence: Implications for mental health, educational attainment and psychosocial functioning. *Development & Psychopathology*.

Stephoe, A., Shankar, A., Demakaos, P., & Wardle, J. (2013). Social isolation, loneliness, and all-cause mortality in older men and women. *PNAS, 110*(15) 5797-5801.

Woodward, L. J., & Ferguson, D. M. (2000). Childhood peer relationship problems and later risks of educational under-achievement and unemployment. *Journal of Child Psychology and Psychiatry, 41*(2), 191-201.

Data Security Agreement

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Proposing Author	Timothy Matthews
Today's Date	25 Nov 2021

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(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.

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