E-Risk Study Concept Paper Form

Response was completed on 08-04-2025 12:18.

Record ID	26

1. Collaborating researchers

Please note:

Once approved, a formal data use agreement will be required between King's College London and the university or research organisation that employs any collaborator having access to the data if they are not a member of staff, a student or affiliate of King's College London. This needs to be signed by both universities/organisations before data access can be granted.

For projects carried out by a student (e.g., MSc/MA, MPhil/PhD, clinical doctorate), the lead applicant should be the student's supervisor at the same university, and the student should be named as the student collaborator requiring access to the data.

If you have additional collaborators, please name them below and indicate whether they need to have access to the data. It would be common, for instance, for other researchers to see summary results of analyses and act as co-authors on your paper without having access to the data. You will not be permitted to share the dataset except with those indicated in the table as requiring access.

Applicable?	**Category**	**Name**	**Email address**	**University/organisation**	**Needs access to data for analysis?**
	Applicant **(lead researcher)**	Bridget Bryan	bridget.bryan@kcl.ac.uk	King's College London	(●) Yes ( ) No
( ) Applicable (●) Not applicable	**Student collaborator** ***(if data is for their dissertation/thesis)***				
(●) Applicable ( ) Not applicable	**E-Risk Sponsor** ***(if applicant is not an E-Risk investigator)***	Louise Arseneault	louise.arseneault@kcl.ac.uk	King's College London	(●) Yes ( ) No

Are there additional collaborators to add?	(●) Yes ( ) No

If yes, how many additional collaborators would you like to add?	3

Category	Name	Email address	University/organisation	Needs access to data for analysis?
Other collaborator #1	Katherine Thompson	thom1336@purdue.edu	Purdue University	No
Other collaborator #2	Timothy Matthews	t.matthews@greenwich.ac.uk	University of Greenwich	No
Other collaborator #3	E-Risk study team	NA	NA	No

Applicants: If you would like to continue your application later, please press the "Save and return later" button below. Please copy or write down the Return code provided.

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2. The project proposal

Note: *Please provide sufficient detail to enable the committee to review your proposal. Please be as specific as possible about the project aims and analysis methods as once approved this concept paper will be posted publicly and thus will act as a form of pre-registration of your project. Expand boxes as required.*

Title of project	Investigating the interplay of loneliness and social isolation across adolescence: Findings from a nationally representative longitudinal study
Background and rationale for project ***(approx. 300 - 1000 words)***	Social relationships and interpersonal connections are essential for human survival and functioning. A growing body of research has pointed to long term implications of deficits in social connection for mental and physical health (Holt-Lunstad 2022), as well as functioning (Matthews et al. 2019, Thompson et al. 2022) and socioeconomic position (Bryan et al. 2024). In particular, social isolation, the objective absence or lack of relationships and connections, and loneliness, the subjective feeling that one's desired quantity and quality of social relationships (Cacioppo et al., 2011), are insufficient have been identified as important risk factors for poor outcomes (Caspi et al. 2006, Park et al. 2020, Leigh-Hunt et al. 2017) and are considered threats to public health (US Surgeon General 2023). While isolation and loneliness often come together, they are conceptually distinct and can be experienced independently from one another. Social isolation and loneliness are moderately correlated (r = 0.39), and only half of individuals in the top quartile for social isolation are in

	the top quartile for loneliness (Matthews et al. 2016). While research on the health impact of loneliness and isolation often note this conceptual distinction, few studies examine the constructs together, or focus on how one of the constructs influence outcomes over and above the other (Holt-Lunstad et al. 2015). As a result, important questions remain about how social isolation and loneliness lead to or interact with each other over time to influence later social connections, as well as health, functioning and socioeconomic outcomes. In particular, few studies have investigated the interplay of loneliness and social isolation over time. Evolutionary theories of loneliness suggest that loneliness could buffer the effect of social isolation by signalling to isolated individuals that their social relationships are under threat and motivating them to replace or repair damaged relationships (Cacioppo et al. 2015). Within this context, isolated individuals who experience loneliness may be more driven to build positive social connections and go on to be less isolated than other isolated but less lonely individuals (Qualter et al. 2015). However, few studies have investigated this buffering hypothesis using longitudinal indicators of social isolation, raising questions around whether and how loneliness moderates the impact of social isolation across time. Evidence that lonely individuals are less trusting of others, more anxious and pessimistic, and approach social situations in a more defensive manner (Cacioppo et al. 2006, Cacioppo & Hawkley 2005, Cacioppo & Hawkley 2009), suggests that loneliness may rather exacerbate the effect of social isolation by acting as a barrier to developing positive social relationships. As such, loneliness experienced in the context of isolation may lead to greater isolation over time. In light of the proliferation of the evolutionary theory in the loneliness literature (e.g. Goossens et al. 2015, Martina-Maria et al. 2020, Spithoven et al. 2019, Keller et al. 2023, Hawkley et al. 2019), longitudinal research using repeated measures of loneliness and isolation is needed to test whether and how loneliness and social isolation interact over time. Questions also remain about how social isolation and loneliness work together to influence health and functioning. Loneliness and social isolation have been identified as important risk factors for mental health symptoms, including depression, anxiety (Matthews et al. 2019) and psychotic-like experiences (Thompson et al. 2022), as well as physical health behaviours (Matthews et al. 2019, Thompson et al. 2022) and socioeconomic outcomes (Bryan et al. 2024). Existing evidence suggests that Lloneliness and social isolation are independently associated with these outcomes (Matthews et al. 2016, Holt-Lunstad 2015), suggesting that there may be a cumulative effect of these social deficits on health and functioning. Loneliness may also exacerbate the effect of social isolation. Lonelier individuals may be more sensitive to social isolation, finding the experience more stressful and resulting in greater mental health and physical health consequences associated with isolation than less lonely individuals. Understanding the cumulative effect of loneliness and isolation, as well as how they interact to impact health and functioning is needed to inform intervention strategies in identifying young people at most risk of poor health, functioning and socioeconomic outcomes. Longitudinal research using robust, repeated measures of loneliness and isolation is needed to disentangle the concepts of loneliness and social isolation and test how they work together to influence social connection, health and socioeconomic outcomes.
Project aims / objectives	The present study aims to address the following research questions: 1. Do loneliness and social isolation lead to each other from early to late adolescence? First, we will investigate the temporal precedence and strength of the associations between loneliness and social isolation across adolescence. 2. Does loneliness buffer or exacerbate the effect of earlier social isolation on later isolation? Second, we will test whether loneliness moderates the association between social isolation in

	early and late adolescence. 3. Do loneliness and isolation have an additive effect on mental health problems, health behaviours, employment prospects and social behaviour? Third, we will test the concurrent and prospective associations between loneliness and social isolation in late adolescence and concurrent mental health symptoms, health behaviour, employment outcomes and social coping styles. See Table 1 for a full list of outcomes (document attached). 4. Does loneliness exacerbate the effect of social isolation on concurrent and later mental health, health behaviour, employment prospects and social behaviour? Fourth, we will test whether loneliness moderates the association between social isolation and mental health, health behaviour, employment and coping styles. We will also test whether the association remains after accounting for prior indicators of mental health and functioning.
Brief statement of your hypothesis	Hypothesis 1 (on temporal precedence of loneliness and social isolation): We hypothesise that both phenomena in early adolescence will precede loneliness and social isolation in later adolescence. Hypothesis 2 (on buffering effect of loneliness on later isolation): We hypothesise that loneliness will not buffer the effect of isolation on later isolation, but will exacerbate the effect of isolation over time. Hypothesis 3 (on additive effect of loneliness and isolation on other outcomes): We hypothesise that loneliness and isolation will be associated with indicators of poor mental health, health behaviours, employment and social coping behaviours, even when controlling for each other. Hypothesis 4 (on exacerbation effect of loneliness): We hypothesise that loneliness exacerbates the effect of social isolation on concurrent and later mental health, health behaviours, employment and social coping behaviours. Hypothesis 5 (on prior indicators of mental health and functioning): We hypothesise that childhood indicators of mental health and functioning will partially explain the association between loneliness and social isolation and outcomes, but that the associations will remain significant over and above these controls.
Data analysis methods to be used ***(approx. 100 - 500 words)***	1. A cross lagged panel model will be used to examine the cross-sectional and longitudinal associations between loneliness and social isolation at age 12 and age 18. 2. A linear model will be used to regress age 18 social isolation on age 12 loneliness and social isolation. An interaction term will be added to the model to test whether loneliness moderates the association between social isolation at ages 12 and 18. If the interaction is significant, we will investigate the form of the interaction by plotting the results and performing a simple slopes test. 3. Linear and logistic models will be used to regress indicators of mental health, health behaviours, employment prospects and social coping behaviour at age 18 on concurrent loneliness and social isolation. An interaction term combining loneliness and isolation will be entered as a second step to text whether loneliness exacerbates the effect of isolation on outcomes. If the interaction is significant, we will investigate the form of the interaction by plotting the results and performing a simple slopes test. Age 12 mental health and neuroticism will be entered into all models as a third step to test whether any effects detected are accounted for by childhood confounders.

	4. Linear and logistic models will also be used to regress indicators of mental health, health behaviours, employment prospects and social coping behaviour at age 18 on loneliness and social isolation at age 12. An interaction term combining loneliness and isolation will be entered as a second step to text whether loneliness exacerbates the effect of isolation on outcomes. If the interaction is significant, we will investigate the form of the interaction by plotting the results and performing a simple slopes test. Age 12 mental health and neuroticism will be entered into all models as a third step to test whether any effects detected are accounted for by childhood confounders. All analyses will control for sex and socioeconomic status and adjust for the clustering of twin observations using adjusted standard errors. We will also test whether sex moderates the association between loneliness, isolation and other outcomes. In light of previous work on loneliness and isolation in E-Risk, we do not expect to find that sex moderates the associations (Matthews et al. 2019, Thompson et al. 2022, Bryan et al. 2024).
Significance for theory, research methods, or clinical practice	This project will provide a valuable contribution to the literature on loneliness and isolation by testing an aspect of a prominent theory of the origin and function of loneliness. As previous studies exploring the evolutionary theory of loneliness have rarely used multiple measures of both loneliness and social isolation collected prospectively over time, this study can address an important gap in the literature by investigating the role of loneliness in buffering or exacerbating the effect of social isolation in longitudinal data. This study can also inform strategies aiming to reduce the negative impact of loneliness and social isolation. Greater understanding of how loneliness and social isolation work together to influence mental health, physical health, functioning and socioeconomic position will facilitate the identification of young people most at risk of experiencing difficulties associated with social deficits. This insight can guide more targeted intervention efforts that may more effectively prevent the long-term consequences of loneliness and social isolation in adulthood.
References cited	Bryan, B. T., Thompson, K. N., Goldman-Mellor, S., Moffitt, T. E., Odgers, C. L., So, S. L. S., Uddin-Rahmann, M., Wertz, J., Matthews, T & Arseneault, L. (2024). The socioeconomic consequences of loneliness: Evidence from a nationally representative longitudinal study of young adults. Social Science & Medicine, 345, 116697. Cacioppo, J. T., Cacioppo, S., Cole, S. W., Capitanio, J. P., Goossens, L., & Boomsma, D. I. (2015). Loneliness across phylogeny and a call for comparative studies and animal models. Perspectives on Psychological Science, 10(2), 202-212. Cacioppo, J. T., Hawkley, L. C., Norman, G. J., & Berntson, G. G. (2011). Social isolation. Annals of the New York Academy of Sciences, 1231(1), 17-22. Caspi, A., Harrington, H., Moffitt, T. E., Milne, B. J., & Poulton, R. (2006). Socially isolated children 20 years later: risk of cardiovascular disease. Archives of Pediatrics & Adolescent Medicine, 160(8), 805-811. Goossens, L., Van Roekel, E., Verhagen, M., Cacioppo, J. T., Cacioppo, S., Maes, M., & Boomsma, D. I. (2015). The genetics of loneliness: Linking evolutionary theory to genome-wide genetics, epigenetics, and social science. Perspectives on Psychological Science, 10(2), 213-226. Hawkley, L. C., & Schumm, L. P. (2019). Examining the effects of loneliness on health using in-home panel studies with biomeasures: Benefits, challenges, and implications for the Evolutionary Theory of Loneliness. A commentary on Das (2018). Social Science & Medicine, 223, 113-116.

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Are there any files you would like to upload to support your concept paper?	(•) Yes ( ) No

If yes, how many files would you like to upload?	1

File 1 - Please upload	Table1_BBconceptpaper.docx (0.02 MB)

your file	

Applicants: If you would like to continue your application later, please press the "Save and return later" button below. Please copy or write down the Return code provided.

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3. Expected project outcomes

Please note:

The stated end date must be within 24 months of the date when this form is submitted. This end date will form part of the formal data use agreement and on this date you should delete the dataset. Therefore, it must be a realistic date for completion of the project including all analysis, writing a manuscript, review of the manuscript by all collaborators, submission, revisions, and acceptance of a paper for publication.

If you require an extension to the end date of the project, then you should contact Prof Fisher (helen.2.fisher@kcl.ac.uk) to discuss this. If you have signed a formal data use agreement, you will need to complete a form to request a licence extension. In some cases, we may also ask you to complete a new concept paper form if there have been substantial changes to the project or a long period of time has elapsed (e.g., greater than a year since the end date of the original project).

If the objective of the project is not a journal publication, please suggest an end date within 12 months instead of 24 months, and state a measurable, concrete outcome. If the objective of the project is a student dissertation, then the expected end date should be the deadline for submission of the dissertation; dissertation projects will only be accepted on agreement that they are strictly not for publication.

Date form submitted	14-03-2025 *DD-MM-YYYY*
End date for the project	31-03-2027 D-M-Y *DD-MM-YYYY*
Do you expect to publish your results in a journal?	(selected) Yes No
If yes, please provide a provisional list of author names	**Bridget Bryan, Katherine Thompson, Timothy Matthews, Louise Arseneault, Helen Fisher**
If yes, please provide a provisional list of journals	**Development and Psychopathology, Journal of Child Psychology and Psychiatry**

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4. List of variables required

Please note:

When specifying variables, please be unambiguous. For each variable, specify the name of the measure, twin age, informant, and if you want specific subscales/derived categories (e.g., Depression from interview with twin at age 18; both number of symptoms and DSM-IV diagnosis). Alternatively, for maximum clarity, give actual variable names (e.g., MDESXE18 - MDE Symptom scale - P18 - Elder; DXMDEE18 - Major depressive episode, dsm4 - P18 - Elder).

By default, the dataset will usually include twin and family IDs, the "random" and "true" twin order variables, the cohort the twin is from (1994 or 1995), twin sex, ethnicity and zygosity variables, and family socioeconomic status at age 5. These routine background variables are listed in the table below. If you require further background variables, please specify them in your list.

Access to some parts of the dataset are restricted, namely identifiable data (e.g., postcodes, video recordings, individual-level genotypic and epigenetic data) which will not be shared outside King's College London, and linked administrative data which is only accessible via the UK Longitudinal Linkage Collaboration's Trusted Research Environment (this requires a separate formal data access agreement).

Background variables that will be included by default:

Variable name	Description
FAMILYID	Unique family identifier
ATWINID	Twin A ID (ex chkdg)
BTWINID	Twin B ID (ex chkdg)
RORDERP5	Random Twin Order
TORDER	True Twin Order
RISKS	Sample Groups
COHORT	Cohort
SAMPSEX	Sex of Twins
ZYGOSITY	Zygosity
SETHNIC	Ethnicity of Twins
SESWQ35	Social Class Composite

Please select the variables that will be requested	☐ Age 5 variables ☐ Age 7 variables ☐ Age 10 variables ☑ Age 12 variables ☑ Age 18 variables ☐ Age 26 variables ☐ Age 30* variables

Age 12 variables	**Loneliness and social isolation** **LONELYE12 Loneliness age 12 - Elder** **SISOE12 Social isolation elder (mum + teacher report)** **SISOET12 Social isolation elder (teacher report)** **SISOEM12 Social isolation elder (mother report)** **Mental health** **CDIE12 Depression Scale - CDI - Elder**

	DEPRSE12 Depression scale [from CBCL] - P12 - Elder MASCE12 Anxiety Scale - MASC - Elder BFINE12 Neuroticism Subscale (BFI) - Elder Twin PSYSYMP01E12 Psychosis Symptom Count - Verified Coding - 0, 1+ - Elder dp1e12 Feeling sad dp2e12 Things working out dp3e12 Doing things ok dp4e12 Hate myself dp5e12 Feel like crying dp6e12 Things bother me dp7e12 I look OK dp8e12 Feel alone dp9e12 Plenty of friends dp10e12 Loves me dp11e12 Having fun dp12e12 I am bad dp13e12 Bad things happening dp14e12 Bad things my fault dp15e12 Being with people dp16e12 Make up mind dp17e12 Push myself - schoolwork dp18e12 Trouble sleeping dp19e12 Am tired dp20e12 Feel like eating dp21e12 Aches and pains - worry dp22e12 Fun at school dp23e12 Schoolwork OK dp24e12 Good as other kids dp25e12 Do what I am told dp26e12 Get along with people. PE12M12 'Feels or complains that no-one loves him\her' PE15M12 'Feels too guilty' PE1M12 'There is very little he/she enjoys' PE23M12 'Underactive, slow-moving or lacks energy' PE24M12 'Unhappy, sad or depressed' PE25M12 'Withdrawn, doesn't get involved with others' PE9M12 'Feels worthless or inferior' ** Requesting items to derive versions of the depression variables with the loneliness and isolation items omitted
Age 18 variables	**Loneliness and social isolation LONELYE18 Loneliness scale - P18 - Elder SOCISOE18 Social Isolation scale - P18 - Elder Mental health and wellbeing MDESXE18 Depression symptoms scale - P18 - Elder GADSXE18 GAD symptoms scale - P18 - Elder PSYEXPE18 Psychotic Experiences Scale - P18 - Elder PSYEXPCE18 - Psychotic Experiences (cat) - P18 - Elder LIFSATE18 Life satisfaction (average) - P18 - Elder Health behaviours and functioning AUDSXE18 Alcohol use disorder symptoms scale (DSM5) - P18 - Elder SMKCURE18 Smoking daily - current - P18 - Elder**

	SMKCNUME18 Smoking - current (number of cigarettes) - P18 - Elder **SMKPKYRE18 Smoking Pack years (Ages 12 to 18) - P18 - Elder** **PHYACTE18 Physical activity (overall) - P18 - Elder** **PSQIE18 PSQI - Global Score - P18 - Elder [sleep]** **Coping behaviours - variable names from age 18 booklet** **COP1 Coping - Talk with other people about it** **COP2 Coping - Talk with a therapist/counsellor** **COP3 Coping - Work more/work harder** **COP4 Coping - Exercise** **COP5 Coping - Eat more** **COP6 Coping - Smoke** **COP7 Coping - Drink alcohol** **COP8 Coping - Sleep more** **COP9 Coping - Withdraw/spend more time alone** **COP10 Coping - Obsess about problems** **COP11 Coping - Ignore problems/put them out of your mind** **COP12 Coping - Focus on other things in your life** **COP13 Coping - Take steps right away to solve the problem** **COP14 Coping - Pray/go to church/talk with a religious leader** **COP15 Coping - Give up** **Education, employment and socioeconomic outcomes** **EDUCACHVE18 Highest educational achievement (based on QCF) - P18 - Elder** **NEETE18 NEET: Not in education, employment or training - P18 - Elder** **DEM5E18 Currently working - elder** **DEM2E18 Currently studying - elder** **SICOUNTRYE18 Subjective social status ladder task - elder** **Employability Variable derived for Bryan et al. 2024 - I am liaising with Stefan to save this variable**

Are you requesting access to identifiable or linked data?	○ Yes ◉ No

Which format(s) do you require the data in?	☐ CSV ☐ Excel ☐ SPSS ☑ STATA ☐ Other

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5. Data security agreement and signature

Please click in each box to indicate that you will adhere to each of the points listed below.