



UvA-DARE (Digital Academic Repository)

Mapping vulnerability factors of chronic emotional and social loneliness

A network analysis

van den Bulck, C.M.M.; van Emmerik, A.A.P.; Blanken, T.F.; Kamphuis, J.H.; Dijk, C.

DOI

[10.1016/j.jad.2025.02.105](https://doi.org/10.1016/j.jad.2025.02.105)

Publication date

2025

Document Version

Final published version

Published in

Journal of Affective Disorders

License

CC BY

[Link to publication](#)

Citation for published version (APA):

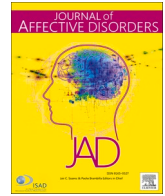
van den Bulck, C. M. M., van Emmerik, A. A. P., Blanken, T. F., Kamphuis, J. H., & Dijk, C. (2025). Mapping vulnerability factors of chronic emotional and social loneliness: A network analysis. *Journal of Affective Disorders*, 378, 293-300.
<https://doi.org/10.1016/j.jad.2025.02.105>

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, P.O. Box 19185, 1000 GD Amsterdam, The Netherlands. You will be contacted as soon as possible.



Research paper

Mapping vulnerability factors of chronic emotional and social loneliness: A network analysis

Carmen M.M. van den Bulck^{a,*}, Arnold A.P. van Emmerik^a, Tessa F. Blanken^{a,b},
Jan H. Kamphuis^a, Corine Dijk^a

^a Department of Clinical Psychology, University of Amsterdam, Nieuwe Achtergracht 129-B, 1018 WS Amsterdam, Netherlands

^b Department of Psychological Methods, University of Amsterdam, Nieuwe Achtergracht 129-B, 1018 WS Amsterdam, Netherlands

ARTICLE INFO

Keywords:

Chronic loneliness
Emotional loneliness
Social loneliness
Depression
Social anxiety
Attachment styles
Interpersonal behavior

ABSTRACT

Background: Chronic loneliness adversely impacts both mental and physical health. As current interventions are only moderately effective, examining vulnerability factors reflected in interpersonal behavior and their relationships with specific chronic loneliness subtypes may provide insights. The present study explored the associations between loneliness vulnerability factors and two subtypes of chronic loneliness: chronic emotional loneliness (a longing for intimate connections) and chronic social loneliness (dissatisfaction with the quantity and quality of one's social network).

Methods: The sample consisted of 294 university students who had recently started at a new university. Participants completed surveys across three time points, separated by three-month intervals, including questionnaires on emotional and social loneliness, adult attachment styles, interpersonal behavioral styles, and features of emotional disorders. To explore relationships, we used network analysis by estimating a Mixed Graphical Model (MGM), in which chronic emotional loneliness and chronic social loneliness were dichotomized as binary variables (absence versus presence), while vulnerability factors were treated as continuous variables.

Results: The network analysis demonstrated that chronic loneliness subtypes were differentially linked to vulnerability factors. Chronic emotional loneliness was predominantly linked to features of emotional disorders, whereas chronic social loneliness demonstrated a negative conditional association with secure attachment style.

Limitations: The assessment of chronic loneliness was based on three time points, which does not capture potential fluctuations between assessments.

Conclusions: These findings highlight the importance of differentiating between chronic loneliness subtypes when examining vulnerability factors. By distinguishing these subtypes, tailored interventions for loneliness can be developed to enhance prevention.

1. Introduction

Chronic loneliness, which is characterized by the persistent feeling of being alone and isolated (Alam et al., 2023; Cacioppo et al., 2006b; Hawkley and Cacioppo, 2010), is a growing public health concern (Cacioppo and Cacioppo, 2018). Loneliness often starts during transitional phases in life (e.g., the transition to university, or retirement; Evans et al., 2022; Kirwan et al., 2023). Although some individuals swiftly adapt to new social environments and expand their social network, others struggle with the accompanying uncertainties and loss of social support (e.g., from family figures; Menzies and Baron, 2013). These individuals may encounter difficulties in establishing new social

connections and experience chronic loneliness (Majorano et al., 2015; Schinka et al., 2013). According to a recent study, 13% of persons aged 15 and older experience chronic loneliness (Lim et al., 2023). Chronic loneliness is associated with negative effects on mental and physical health, as well as with impaired daily functioning and clinical conditions such as depression and social anxiety disorder (Hawkley et al., 2010; Heinrich and Gullone, 2006; Lim et al., 2016). Most studies into vulnerability factors have examined these factors in isolation (Barjaková et al., 2023), which precludes insights on their potential pathways and relative importance in predicting loneliness. In addition, most research measured loneliness at a single point in time, while it is the chronic nature of loneliness that is most detrimental to physical and mental

* Corresponding author.

E-mail address: C.M.M.vandenbulck@uva.nl (C.M.M. van den Bulck).

<https://doi.org/10.1016/j.jad.2025.02.105>

Received 19 December 2024; Received in revised form 11 February 2025; Accepted 27 February 2025

Available online 2 March 2025

0165-0327/© 2025 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

health (Lim et al., 2016). Current interventions have also demonstrated only moderate effectiveness in reducing loneliness (Masi et al., 2010). To improve loneliness interventions, it is essential to gain a better understanding of vulnerability factors that are prevalent in the general population, open to modification, and reflected in interpersonal behavior, as these factors can be addressed in (preventative) interventions.

Most studies investigating vulnerability for loneliness have treated loneliness as a unidimensional construct, thereby overlooking the diverse social needs that underlie different types of loneliness. Weiss (1973) initially proposed two loneliness subtypes: social and emotional loneliness. Social loneliness is characterized by a lack of satisfaction with the quantity and quality of an individual's social network. The definition of emotional loneliness varies depending on the measure used. De Jong-Gierveld and Kamphuis (1985) define emotional loneliness as the subjective emotional experience of loneliness in the context of longing for intimate contacts ("I experience a general sense of emptiness"). In contrast, the research by DiTommaso and Spinner (1993) define emotional loneliness primarily in terms of the absence of intimate connections. Consequently, findings from studies differing between these definitions offer complementary but not directly comparable insights.

Prior research indicates that significant changes in an individual's social environment increase vulnerability to chronic loneliness, which may explain the relatively high prevalence of loneliness among young adults compared to people in other stages of development (for a review, see Qualter et al., 2015). Therefore, examining loneliness subtypes and their chronicity in young adults undergoing a transitional phase may enhance the understanding of relevant vulnerability factors. Rather than focusing on isolated vulnerability factors, exploring the relative importance of vulnerability factors in predicting chronic loneliness subtypes and their potential pathways could provide insights that have not been addressed by previous studies. Ultimately, this could inform interventions tailored to specific loneliness subtypes.

Individual differences in the development of chronic loneliness during a transitional phase may be partly explained by adult attachment styles (Koepeke and Denissen, 2012). Adult attachment pertains to individuals' perceptions of themselves and others within relationships (Bartholomew and Horowitz, 1991). Bartholomew and Horowitz (1991) proposed four adult attachment styles: secure (positive self and others), preoccupied (negative self and positive others), fearful (negative self and others) and dismissive (positive self and negative others; Bartholomew and Horowitz, 1991; Hofstra, 2009). These latter three attachment styles are commonly referred to as insecure attachment styles (Santoro et al., 2024). In general, secure attachment is associated with lower loneliness levels, whereas insecure attachment styles are linked to higher loneliness levels (Shorter et al., 2022; Spence et al., 2018). Similar findings also emerged when distinguishing between loneliness subtypes (Bernardon et al., 2011; DiTommaso et al., 2002). One study showed distinct effects for each subtype: preoccupied attachment style was related to increased emotional loneliness, whereas dismissive attachment was related to increased social loneliness (DiTommaso et al., 2002). However, we are not aware of any studies examining the relationship between adult attachment styles and emotional loneliness as measured by De Jong-Gierveld and Kamphuis (1985). In addition, these prior studies assessed loneliness at a single time point, limiting our understanding of the relationship between adult attachment and chronic loneliness subtypes.

A possible pathway linking adult attachment to chronic loneliness involves behavior in interpersonal situations (Bartholomew and Horowitz, 1991; Rotenberg et al., 2004). Interpersonal behaviors are often conceptualized using the interpersonal circumplex, which categorizes them along two primary dimensions: assured/dominant versus submissive/inhibited and friendly versus hostile (Fournier et al., 2010; Wiggins, 1991). Dominance and social rank oriented individuals often focus on increasing or maintaining their position within social hierarchies

(McEwan et al., 2011). Achieving a high social rank can lead to lower levels of loneliness, while unsuccessful attempts can intensify feelings of defeat and loneliness (Sturman and Mongrain, 2007; Waytz et al., 2015). On the opposite end of this dimension, behaving more submissive and socially inhibited is related to increased loneliness (Cacioppo et al., 2006a; Horowitz and de Sales French, 1979). Regarding the second dimension, friendliness refers to pro-social behaviors, including being compassionate, helpful and caring, and are linked to lower loneliness levels (Best et al., 2021; Griese and Buhs, 2013; McEwan et al., 2011). In contrast, unfriendly behaviors, including acting cold and difficulties showing affection, are related to elevated loneliness levels (Cacioppo and Hawley, 2009; Wei et al., 2005). In summary, adaptive interpersonal behavioral styles, such as being assured and friendly, may foster satisfying relationships and prevent loneliness. Conversely, dysfunctional interpersonal behaviors, such as acting submissive and inhibited have been associated with increased loneliness.

Previous studies show that loneliness often co-occurs with two highly prevalent emotional disorders: social anxiety and depression (Barlow, 1991; Erzen and Çikrikci, 2018; Maes et al., 2019; Ten Have et al., 2023). The overlap and distinction between social anxiety and loneliness have been a subject of prior research (for reviews, see Fung et al., 2017; Teo et al., 2013). The strong connection between social anxiety and loneliness can be explained by shared intrapersonal and interpersonal processes, such as processing social information in a threatening manner and engaging in avoidant, self-protective behaviors (Cacioppo and Hawley, 2009; Clark and Wells, 1995). Longitudinal studies have demonstrated that the association between loneliness and social anxiety is reciprocal over time (Danneel et al., 2019; Lim et al., 2016; Maes et al., 2019). For depression, feelings of gloominess and sadness are associated with increased loneliness (Cacioppo et al., 2006a; Cacioppo et al., 2006b; Van Beljouw et al., 2014). In addition, loneliness has been linked to fatigue and reduced daytime functioning, both of which are key features of depression (Grygiel et al., 2023; Hawley and Cacioppo, 2010; Jaremka et al., 2014). Similar to social anxiety, the relationship between loneliness and depression is found to be reciprocal over time (Luo, 2022; Ren et al., 2020).

When differentiating between loneliness subtypes, both emotional and social loneliness have been linked to elevated levels of depression. However, the relationship between depression and emotional loneliness was stronger than the relationship between depression and social loneliness (Diehl et al., 2018; Hyland et al., 2018). This is in line with the research of Wolters et al. (2023), which examined the unique relationships between emotional disorders and loneliness subtypes by using network analysis. These findings show that while both loneliness subtypes link to higher levels of depression and social anxiety, these conditional associations are stronger for emotional loneliness. However, the links with more chronic forms of these subtypes remain unclear. By differentiating specific features of emotional disorders, we can more accurately define the potential pathways between chronic loneliness subtypes and emotional disorders.

The current study aims to explore the relative importance of vulnerability factors in predicting chronic loneliness and their potential pathways during a transitional phase of individuals' lives (i.e., starting at a new university). We focus on vulnerability factors that are reflected in interpersonal behavior, open to modification and prevalent in the general population, including adult attachment styles, interpersonal behavioral styles and features of emotional disorders. Using a network analysis approach, we intend to map the conditional relationships between these vulnerability factors at the beginning of the transition to a new university, and their conditional associations with chronic emotional and social loneliness assessed over a six-month period. Given the exploratory nature of the study and the potential of network analysis to generate hypotheses based on the identified pathways (Borsboom et al., 2021), we will not test specific hypotheses.

2. Methods

2.1. Participants and procedure

Participants were students at two universities in a major Dutch city and were recruited via the research websites of the university, during the break of a lecture in an introductory course, as well as through the distribution of posters and flyers across the university campuses. Eligible participants met the following inclusion criteria: being at least 18 years old and starting a new study at a new university (individuals pursuing a master's degree at the same university as their bachelor's degree were not invited). Participants gave informed consent before completing online versions of self-report questionnaires (see Section 2.2. Measures). The survey required approximately 20 min to complete (first assessment; T1). At the second and third assessment (T2 and T3), participants received the same survey via email. T1 took place at the beginning of the semester in September 2021, T2 in November 2021 and T3 in February 2022. Compensation for participation in all assessments was provided in the form of either one research credit or a monetary reward of €7.50. The sample used for the current study is the subset of participants that completed all three assessments ($N = 294$, $M_{\text{age}} = 21$, 69.7 % female), representing 89.4 % of the total participants who enrolled in the study ($N = 329$). The study is approved by the Ethics Review Board of University of Amsterdam. Due to its exploratory nature, the study was not pre-registered.

2.2. Measures

2.2.1. Chronic social and emotional loneliness

The 11-item De Jong Gierveld Loneliness Scale (DJGLS; De Jong-Gierveld and Kamphuis, 1985) was used to measure emotional and social loneliness. Participants rate the items on a 5-point scale (1 = “yes!” to 5 = “no!”). The emotional loneliness subscale contains six items and the social loneliness scale five items. Example items include “I miss having a really close friend” for emotional loneliness and “There are plenty of people I can lean on when I have problems” for social loneliness. Positively framed items are reverse scored. Item responses of 1–2 are dichotomized to 0, and 3–5 to 1, yielding scores from 0 to 5 for social loneliness and 0 to 6 for emotional loneliness. Scores of 3–6 on the emotional loneliness subscale indicate emotional loneliness, while scores of 3–5 on the social loneliness subscale indicate social loneliness (Van Tilburg and de Jong-Gierveld, 1999). In the present study, chronic emotional and social loneliness are defined as the presence of emotional or social loneliness at T1, T2, and T3. The subscales demonstrated good internal consistency in previous research (De Jong Gierveld and Van Tilburg, 2006). Internal consistency in the current sample was good (emotional loneliness: $\alpha = 0.80$; social loneliness: $\alpha = 0.83$).

2.2.2. Adult attachment styles

The 24-item Attachment Style Questionnaire (ASQ; Van Oudenhoven et al., 2003) was used to measure adult attachment styles and is based on the attachment framework of Bartholomew and Horowitz (1991). The ASQ consists of four subscales: secure, dismissive, fearful, and preoccupied. Participants rate statements about relationships with other people on a 5-point scale, (1 = “Strongly Disagree” to 5 = “Strongly Agree”) resulting in subscale scores ranging between 1 to 35 (secure and preoccupied subscale) and 1 to 25 (fearful and dismissive subscale). An example item of the secure subscale is “I feel at ease in emotional relationships”. The subscales demonstrated satisfactory internal consistency in previous research (Hofstra, 2009). Internal consistency in the current sample was satisfactory (secure: $\alpha = 0.79$, fearful: $\alpha = 0.82$, dismissive: $\alpha = 0.68$ and preoccupied: $\alpha = 0.84$).

2.2.3. Interpersonal behavioral styles

The 32-item Inventory of Interpersonal Problems-32 (IIP-32; Barkham et al., 1996) was used to assess problematic interpersonal

behavioral styles. The IIP-32 consists of eight subscales. In the present study, only the Cold/Distant subscale and the Avoidant/Socially Inhibited subscale were used, as these are most related to the dysfunctional interpersonal behavioral styles associated with the two primary dimensions of the interpersonal circumplex. Previous research indicates that these subscales are most strongly associated with loneliness (Horowitz and de Sales French, 1979). On the Cold/Distant and the Avoidant/Socially Inhibited subscales, participants rate on a 5-point scale (0 = “not at all” to 4 = “extremely”) how hard they find certain interpersonal behaviors to perform. Both subscales consist of four items, resulting in subscale scores ranging between 0 and 16. Example items are “It is hard for me to join in on groups” (Avoidant/Socially Inhibited) and “It is hard for me to show affection to people” (Cold/Distant). The subscales showed good internal consistency in previous research (Bailey et al., 2018). The internal consistency in the current sample was satisfactory (Avoidant/Socially Inhibited: $\alpha = 0.87$, Cold/Distant: $\alpha = 0.74$).

The 18-item Competitiveness and Caring Scale (CCS; McEwan et al., 2011) was used to assess the propensity to behave in a competitive or caring way, reflecting the adaptive interpersonal behavioral styles corresponding to the two primary dimensions represented in the interpersonal circumplex model. Participants are asked to indicate on a 10-point bipolar scale how they perceive themselves. Nine items constitute the competitiveness subscale (e.g., 1 = “unassertive” to 10 = “assertive”) and 9 items represent the caring subscale (e.g., 1 = “unhelpful” to 10 = “helpful”), resulting in subscale scores ranging between 1 and 90. The subscales demonstrated good internal consistency in previous research (McEwan et al., 2011). The internal consistency in the current sample was good (Competitiveness: $\alpha = 0.85$ and Caring: $\alpha = 0.85$).

2.2.4. Defeat

The 16-item Defeat Scale (Gilbert and Allan, 1998) was used to assess feelings of defeat during the past seven days. Participants rate their perception of struggles and losing social rank on a 5-point scale (0 = “never” to 4 = “always”) resulting in a total score ranging between 0 and 64. An example item is “I feel powerless”. The scale demonstrated excellent internal consistency in previous research (Gilbert and Allan, 1998). The internal consistency in the current sample was excellent ($\alpha = 0.94$).

2.2.5. Features of emotional disorders

The 20-item Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) was used to measure feelings of gloominess and sadness during the past week. Participants rate the items on a 4-point scale, from 0 = “rarely or none of the time (less than 1 Day)” to 3 = “most or all of the time (5-7 days)”. We took into account the potential confounding influence of items assessing features that overlap with other constructs examined in this study (e.g., sleepiness, exhaustion, energy level, feelings of inferiority, anxiety, perceived rejection, social withdrawal and loneliness). Consequently, we calculated sum scores of the items specifically addressing feelings of gloominess and sadness (items 3, 6, 17, 18). An example item is “I felt sad”. In the current sample, these items demonstrated good internal consistency ($\alpha = 0.85$).

The 20-item Social Interaction Anxiety Scale (SIAS; Mattick and Clarke, 1998) was used to assess anxiety when engaging in social interactions. Items are rated on a 5-point scale (0 = “not at all” to 4 = “very much”). An example item is: “I am tense mixing in a group”. The scale has demonstrated good internal consistency in previous research (Mattick and Clarke, 1998). The internal consistency in the current sample was excellent ($\alpha = 0.94$).

The 5-item questionnaire from Hawkey et al. (2010) was used to measure daytime functioning over the last seven days. This scale rates the extent of sleepiness, exhaustion, liveliness, energy and fatigue on a 5-point scale (1 = “not at all” to 5 = “very much”). This scale demonstrated good internal consistency in previous research (Hawkey et al., 2010). The internal consistency in the current sample was good ($\alpha = 0.84$).

2.3. Statistical analyses

Bivariate correlations were conducted to provide insights into the relationships between vulnerability factors and chronic loneliness subtypes (emotional or social). To evaluate how chronic emotional loneliness, chronic social loneliness and all vulnerability factors relate to each other, while controlling for the influence of confounding factors, we estimated a Mixed Graphical Model (MGM; Haslbeck and Waldorp, 2020). In this model, vulnerability factors at T1 are included as continuous variables and chronic emotional and social loneliness are dichotomized as binary variables (0 indicating the absence and 1 indicating the presence of chronic emotional or chronic social loneliness at T1, T2 and T3). In the network visualization, the vulnerability factors are represented as nodes in circular form, while indicators of chronic emotional and social loneliness are represented as nodes in square form. The connections between the nodes, depicted as edges, represent the conditional associations between two variables. Consequently, the edges in MGM identify unique relationships between variables, while taking the influence of all other variables in the network into account. Given the many parameters relative to the number of observations and the risk of overfitting the data, we applied LASSO regularization (Isvoranu and Epskamp, 2021). LASSO regularization is suited in situations where the number of parameters exceed the number of observations and helps ensure the robustness of our findings against spurious associations stemming from sampling variability (Epskamp and Fried, 2018). LASSO regularization involves a tuning parameter, which controls the degree of regularization (Ravikumar et al., 2010). Higher values of the tuning parameter correspond to more regularization and lead to sparser networks, while lower values correspond to less regularization and result in denser networks. We selected the optimal tuning parameter using the Extended Bayesian Information Criterion (EBIC), setting a hyperparameter of 0 to err on the side of discovery (Epskamp and Fried, 2018). These analyses were performed in R (version 4.3.2) using the packages ‘qgraph’, ‘bootnet’, and ‘mgm’.

To assess the accuracy and robustness of the edge weights, we ran 1000 bootstrap samples with replacement (Borsboom et al., 2018). In each of the bootstrapped datasets we fitted an MGM with the EBIC hyperparameter set to 0, yielding 1000 estimates for each edge. It is important to note that through LASSO regularization the parameters are shrunken towards zero. Consequently, the edge parameters and sampling distribution are biased towards zero and we can therefore not interpret the bootstrapped confidence intervals (CIs) as regular CIs, meaning that the inclusion of zero does not indicate the absence of an effect (Waldorp and Haslbeck, 2024). Therefore, we opted to plot the 5 % and 95 % quantiles only for instances where the parameter was not put to zero. For each edge we also plot the proportion of bootstrap samples in which the edge was included (Epskamp et al., 2018). We interpret both the stability (i.e., the proportion of bootstrap samples in which the edge was included in the network) and precision of our estimates (i.e., when the edge is included in the network, how much variation is observed in the estimated edge weights). We are interested in the vulnerability factors that directly link to loneliness. Given that the vulnerability are themselves likely to be related, we will also focus on the vulnerability factors indirectly linked to loneliness, through their conditional association with the directly linked vulnerability factors.

3. Results

3.1. Descriptive statistics

The emotional and social loneliness scores obtained from all assessments, along with the correlations between these assessments, are presented in Table 1. Based on all assessments, 50 % of participants reported no chronic emotional or social loneliness. Among those who reported chronic loneliness, 25.9 % experienced chronic emotional loneliness without concurrent social loneliness, and 5.4 % experienced

Table 1

Sum scores of DJGLS scores at each assessment and Pearson's correlations between assessments.

	<i>M (SD)</i>	T1 Emotional loneliness	T2 Emotional loneliness
T1 Emotional loneliness	3.5 (1.9)	–	
T2 Emotional loneliness	3.4 (2.0)	0.51**	–
T3 Emotional loneliness	3.4 (2.1)	0.48**	0.58**

	<i>M (SD)</i>	T1 Social loneliness	T2 Social loneliness
T1 Social loneliness	2.2 (1.7)	–	
T2 Social loneliness	2.3 (1.7)	0.57**	–
T3 Social loneliness	2.2 (1.8)	0.56**	0.66**

Note. DJGLS = De Jong Gierveld Loneliness Scale; T1 = first assessment; T2 = second assessment; T3 = third assessment. The emotional loneliness subscale ranges from 0 to 6, while the social loneliness subscale ranges from 0 to 5.

** $p < .001$.

chronic social loneliness without chronic emotional loneliness. Additionally, 18.7 % of participants reported experiencing both chronic emotional and social loneliness.

3.2. Bivariate correlations

The correlations between all vulnerability factors and chronic loneliness subtypes are presented in Table 2. Most vulnerability factors were significantly related to one another ($p < .05$ or $p < .001$), with a few exceptions. Chronic emotional loneliness was significantly associated with 10 out of 12 vulnerability factors ($p < .001$), while chronic social loneliness demonstrated significant associations with 11 out of 12 vulnerability factors ($p < .05$ or $p < .001$). These findings indicate that participants experiencing chronic loneliness differ from those not experiencing chronic loneliness on most vulnerability factors assessed at T1.

3.3. Network analysis

The estimated network is illustrated in Fig. 1. There was a strong conditional association between chronic emotional and social loneliness. However, demonstrating the added value of the network model in comparison to bivariate correlations, these subtypes were differentially linked to vulnerability factors. Chronic emotional loneliness was predominantly linked to features of emotional disorders. Specifically, chronic emotional loneliness was conditionally associated with reduced daytime functioning, heightened feelings of gloominess and sadness, and increased social interaction anxiety. Chronic social loneliness was predominantly related to a reduced secure attachment style, which was itself related to reduced fearful attachment style. Both chronic loneliness subtypes were related to elevated feelings of defeat.

The analyses demonstrated variability in the accuracy and stability of edge estimates. This indicates that some conditional relationships between vulnerability factors and chronic emotional and social loneliness can be established with greater confidence, while others warrant caution due to increased variability. For some included edges we observed greater uncertainty in their estimated strength, as evidenced by wider bootstrapped CIs (e.g., secure attachment style – chronic social loneliness). For other edges we observed less uncertainty, reflected in narrower bootstrapped CIs (e.g., social interaction anxiety – inhibited interpersonal behavioral style). Furthermore, some edges were less stable, as indicated by smaller proportion of bootstrap samples in which the edge was included (e.g., chronic social loneliness – feelings of defeat) and other edges were more stable, as indicated by larger proportion of

Table 2

Pearson and point-biserial correlation coefficients between T1 loneliness vulnerability factors and chronic loneliness subtypes.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Secure	–												
2 Dismiss	–0.17**	–											
3 Fearful	–0.72**	0.15*	–										
4 Preoc	–0.23**	–0.33**	0.31**	–									
5 Comp	0.41**	0.11	–0.33**	–0.42**	–								
6 Care	0.38**	–0.13*	–0.23**	0.08	0.38**	–							
7 Cold	–0.56**	0.06	0.43**	0.17**	–0.29**	–0.40**	–						
8 Inhib	–0.42**	–0.08	0.31**	0.46**	–0.45**	–0.23**	0.51**	–					
9 GloomSad	–0.29**	–0.20**	0.27**	0.31**	–0.33**	–0.10	0.25**	0.43**	–				
10 SA	–0.48**	–0.13*	0.39**	0.61**	–0.56**	–0.21**	0.43**	0.80**	0.42**	–			
11 Defeat	–0.49**	–0.10	0.46**	0.43**	–0.61**	–0.23**	0.41**	0.51**	0.66**	0.59**	–		
12 DayFunc	0.30**	0.18**	–0.26**	–0.41**	0.50**	0.14*	–0.21**	–0.41**	–0.54**	–0.53**	–0.61**	–	
13 CEL	–0.21**	–0.10	0.26**	0.32**	–0.25**	–0.06	0.23**	0.40**	0.41**	0.36**	0.43**	–0.32**	–
14 CSL	–0.38**	–0.01	0.26**	0.14*	–0.27**	–0.21**	0.31**	0.32**	0.35**	0.27**	0.40**	–0.22**	0.37**

Note. Secure = secure attachment style; Dismiss = dismissive attachment style; Fearful = fearful attachment style; Preoc = preoccupied attachment style; Comp = competitive interpersonal behavioral style; Care = caring interpersonal behavioral style; Cold = cold interpersonal behavioral style; Inhib = inhibited interpersonal behavioral style; GloomSad = feelings of gloominess and sadness; SA = social interaction anxiety; Defeat = feelings of defeat; DayFunc = daytime functioning; CEL = chronic emotional loneliness; CSL = chronic social loneliness.

* $p < .05$.

** $p < .001$.

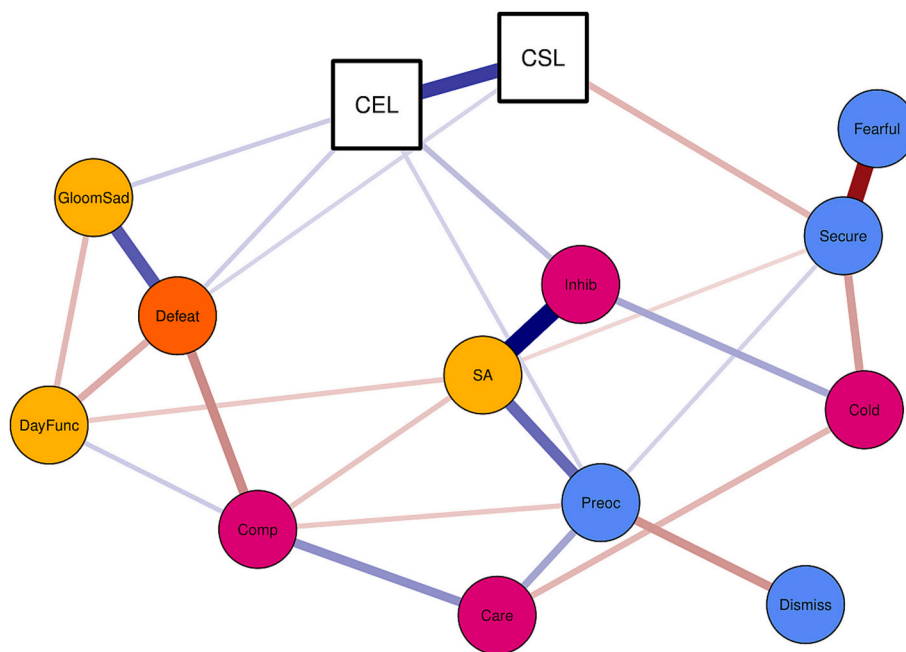


Fig. 1. Estimated regularized network illustrating the conditional relationships among the T1 measures and chronic emotional loneliness and chronic social loneliness.

Note. T1 measures are illustrated by circular nodes and chronic emotional loneliness and chronic social loneliness are illustrated by squared nodes. The edges signify the conditional dependence relationships among the variables and represent the effects that persist after controlling the other variables in the network. The thickness and color saturation of the edges indicate the strength of the association, with blue edges illustrating positive conditional associations and red edges illustrating negative conditional associations. Abbreviations: Secure = secure attachment style; Dismiss = dismissive attachment style; Fearful = fearful attachment style; Preoc = preoccupied attachment style; Comp = competitive interpersonal behavioral style; Care = caring interpersonal behavioral style; Cold = cold interpersonal behavioral style; Inhib = inhibited interpersonal behavioral style; GloomSad = feelings of gloominess and sadness; SA = social interaction anxiety; Defeat = feelings of defeat; DayFunc = daytime functioning; CEL = chronic emotional loneliness; CSL = chronic social loneliness. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

bootstrap samples in which the edge was included (e.g., social interaction anxiety – inhibited interpersonal behavioral style). The details of the bootstrapped sampling distribution are presented in Fig. A.1 in Appendix A of the online supplementary materials.

4. Discussion

The aim of the current study was to map vulnerability factors of

chronic emotional and social loneliness at the onset of a transitional phase in young adults. Despite the strong conditional relationship between the two subtypes, chronic emotional and social loneliness demonstrated differential conditional associations with vulnerability factors. Specifically, the results showed that individuals at the beginning of a transitional phase who experience features of depression or social anxiety are more likely to long for intimate connections, indicating that these individuals experience chronic emotional loneliness. Chronic

social loneliness had a negative conditional relationship with secure attachment style, which in turn was negatively linked to a fearful attachment style. This indicates that individuals who trust others and feel at ease in social interactions report more satisfaction with the quantity and quality of their social network during a transitional phase in their life. Importantly, the link between social loneliness and secure attachment style has not been previously identified in loneliness research.

Feelings of defeat emerged as the only vulnerability factor directly conditionally associated with both subtypes. This indicates that individuals who feel defeated at the start of a transitional phase have a higher chance of experiencing both chronic emotional and social loneliness. Defeat reflects perceived struggles with social rank, which can arise when individuals feel unsuccessful in behaving in a competitive manner (Gilbert and Allan, 1998). During transitional phases, individuals often need to establish new social connections. Challenges in forming these connections, combined with a focus on increasing social status without feeling successful, can elevate feelings of defeat and may lead to loneliness (Gilbert and Allan, 1998; Sturman and Mongrain, 2007; Waytz et al., 2015).

Chronic emotional loneliness was particularly linked with features of emotional disorders, including factors related to social anxiety and depression (Barlow, 1991). Regarding social anxiety, these vulnerability factors in the network model include social interaction anxiety and an inhibited interpersonal behavioral style (Clauss and Blackford, 2012; Kupper and Denollet, 2013; Schofield et al., 2009). Prior research indicates that these links between social anxiety-related factors and loneliness can be explained by overlapping social cognition, such as fear of negative evaluation and anticipating rejection (Alden and Taylor, 2004; Spithoven et al., 2017). Vulnerability factors in the network model related to depression included feeling gloomy, sad and having difficulties in daytime functioning. Previous research indicates that these links between depression-related factors and loneliness can be attributed to shared features, such as increased negativity, low mood, fatigue and daytime dysfunction (Cacioppo et al., 2006a; Cacioppo and Hawkey, 2009; Grygiel et al., 2023; Hawkey et al., 2010). However, these prior studies have primarily considered social anxiety and depression in isolation and have not accounted for loneliness subtypes and chronicity. Building on previous studies, the results from our network model provide further insights into the potential pathways and relative importance of these factors in predicting chronic emotional loneliness specifically.

Considering the current findings, future research could investigate whether targeting features of emotional disorders could reduce chronic emotional loneliness specifically. If cross-validated, treatment planning for emotional loneliness may profit from timely addressing emerging features of emotional disorders. Cognitive behavioral therapy (CBT) has been shown to be effective in reducing social anxiety and depression (Nakao et al., 2021). Masi et al. (2010) identified CBT as only moderately effective in reducing loneliness, although this may be attributed to not distinguishing between loneliness subtypes when evaluating the effectiveness of CBT (Akhter-Khan and Au, 2020). Within this CBT approach, focusing on feelings of gloominess and sadness, as well as inhibited social behavior, could be critical components in preventing or alleviating chronic emotional loneliness, as these factors showed direct links with chronic emotional loneliness.

In contrast to chronic emotional loneliness, different pathways were identified for chronic social loneliness. Specifically, secure attachment emerged as a resilience factor. To determine whether secure attachment is protective against chronic social loneliness, confirmatory empirical research should replicate this conditional association. If so, it may be important to examine whether interventions that have demonstrated efficacy in fostering a secure attachment style, such as attachment-based compassion therapy (ABCT; Beltrán-Ruiz et al., 2023), could also prevent or alleviate chronic social loneliness specifically.

The current results also provide insights into the prevalence rates of

both loneliness subtypes and indicate that chronic emotional loneliness without concurrent chronic social loneliness was more common than the reverse. This finding is consistent with previous studies involving university samples (Diehl et al., 2018; Wolters et al., 2023). This prevalence difference may be attributed to the transition to university, which can increase negative emotions associated with emotional loneliness, including sadness, depression, fear, and uncertainties about the new social environment (Jeyagowri and Ilankumaran, 2018). The difference in prevalence further highlights the need to investigate specific predictors of chronic emotional and social loneliness in order to tailor interventions to the unique needs of each subtype.

The current study has several limitations. First, the study included a university sample, which may limit the generalizability of findings to other populations or transitional periods. Second, the study was conducted during a period of COVID-19 restrictions, including social distancing measures and a lockdown that limited social gatherings and closed universities from December 2021 to January 2022. Previous research showed increased loneliness levels in university students during the COVID-19 pandemic (Koelen et al., 2021; Werner et al., 2021). While no significant differences in loneliness levels were found across the three assessment points in our study, these restrictions may have heightened loneliness levels compared to pre-pandemic periods. Indeed, the observed prevalence rate in our sample was significantly higher than the 13 % prevalence rate of chronic loneliness before COVID-19 (Lim et al., 2023). Third, the current study assessed emotional and social loneliness at three-month intervals, defining chronic emotional or social loneliness as its presence at all three time points. It is important to note that the assessment of chronic loneliness varies significantly across studies. For example, some operationalize chronic loneliness by using retrospective questions about the duration of loneliness (e.g., Kim et al., 2024), while others define it based on the presence of loneliness at two or more time points over varying intervals (e.g., Domènech-Abella and Domènech, 2024; Ladd and Ettekal, 2013; Vanhalst et al., 2015). The methodology of these previous studies and the present study do not capture potential fluctuations between assessments. Future research should consider more frequent measurements over extended periods using momentary assessments to better understand the nature of chronic loneliness and capture the temporal dynamics of emotional and social loneliness trajectories.

To our knowledge, this is the first study to map loneliness vulnerability factors – particularly those reflected in interpersonal behavior – to both chronic emotional loneliness and chronic social loneliness using network analysis at the onset of a transitional phase in young adults. Our findings emphasize the importance of differentiating between subtypes, as chronic emotional and social loneliness were differentially linked to vulnerability factors and therefore may require distinct intervention strategies. While previous research has examined vulnerability factors within loneliness subtypes, the current study specifically examined their relative importance and potential pathways by examining conditional relationships with the chronicity of these subtypes. Given the high prevalence of chronic loneliness in previous research and in the current study, future research should replicate the conditional associations using confirmatory studies before evaluating the efficacy of interventions.

CRediT authorship contribution statement

Carmen M.M. van den Bulck: Writing – review & editing, Writing – original draft, Visualization, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Arnold A.P. van Emmerik:** Writing – review & editing, Supervision, Funding acquisition. **Tessa F. Blanken:** Writing – review & editing, Writing – original draft, Supervision, Methodology. **Jan H. Kamphuis:** Writing – review & editing, Supervision. **Corine Dijk:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT and DeepL Write to conduct grammar checks and improve language accuracy. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Role of funding source

This study was funded by the first flow of funds ('1e geldstroom') and University of Amsterdam.

Declaration of competing interest

None.

Acknowledgements

We would like to thank Lara Bridge for her assistance with the data collection.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jad.2025.02.105>.

References

- Akhter-Khan, S.C., Au, R., 2020. Why loneliness interventions are unsuccessful: a call for precision health. *Adv. Geriatr. Med. Res.* <https://doi.org/10.20900/agmr20200016>.
- Alam, I., Khayri, E., Podger, T.A.B., Aspinall, C., Fuhrmann, D., Lau, J.Y.F., 2023. A call for better research and resources for understanding and combatting youth loneliness: integrating the perspectives of young people and researchers. *Eur. Child Adolesc. Psychiatry* 32 (3), 371–374. <https://doi.org/10.1007/s00787-022-02127-y>.
- Alden, L.E., Taylor, C.T., 2004. Interpersonal processes in social phobia. *Clin. Psychol. Rev.* 24 (7), 857–882. <https://doi.org/10.1016/j.cpr.2004.07.006>.
- Bailey, C., Abate, A., Sharp, C., Venta, A., 2018. Psychometric evaluation of the inventory of interpersonal problems 32. *Bull. Menn. Clin.* 82 (2), 93–113. <https://doi.org/10.1521/bumc.2018.82.2.93>.
- Barjaková, M., Garneró, A., D'Hombres, B., 2023. Risk factors for loneliness: a literature review. *Soc. Sci. Med.* 334, 116163. <https://doi.org/10.1016/j.socscimed.2023.116163>.
- Barkham, M., Hardy, G.E., Startup, M., 1996. The IIP-32: a short version of the inventory of interpersonal problems. *Br. J. Clin. Psychol.* 35 (1), 21–35. <https://doi.org/10.1111/j.2044-8260.1996.tb01159.x>.
- Barlow, D.H., 1991. Disorders of emotion. *Psychol. Inq.* 2 (1), 58–71. https://doi.org/10.1207/s15327965pli0201_15.
- Bartholomew, K., Horowitz, L.M., 1991. Attachment styles among young adults: a test of a four-category model. *J. Pers. Soc. Psychol.* 61 (2), 226–244. <https://doi.org/10.1037/0022-3514.61.2.226>.
- Beltrán-Ruiz, M., Fernández, S., García-Campayo, J., Puebla-Guedea, M., López-Del-Hoyo, Y., Navarro-Gil, M., Montero-Marín, J., 2023. Effectiveness of attachment-based compassion therapy to reduce psychological distress in university students: a randomised controlled trial protocol. *Front. Psychol.* 14. <https://doi.org/10.3389/fpsyg.2023.1185445>.
- Bernardon, S., Babb, K.A., Hakim-Larson, J., Gragg, M., 2011. Loneliness, attachment, and the perception and use of social support in university students. *Can. J. Behav. Sci./Revue Canadienne Des Sciences Du Comportement* 43 (1), 40–51. <https://doi.org/10.1037/a0021199>.
- Best, T., Herring, L., Clarke, C., Kirby, J., Gilbert, P., 2021. The experience of loneliness: the role of fears of compassion and social safeness. *Personal. Individ. Differ.* 183, 111161. <https://doi.org/10.1016/j.paid.2021.111161>.
- Borsboom, D., Robinaugh, D.J., Rhemtulla, M., Cramer, A.O., 2018. Robustness and replicability of psychopathology networks. *World Psychiatry* 17 (2), 143–144. <https://doi.org/10.1002/wps.20515>.
- Borsboom, D., Deserno, M.K., Rhemtulla, M., Epskamp, S., Fried, E.I., McNally, R.J., Robinaugh, D.J., Perugini, M., Dalege, J., Costantini, G., Isvoranu, A., Wysocki, A.C., Van Borkulo, C.D., Van Bork, R., Waldorp, L.J., 2021. Network analysis of multivariate data in psychological science. *Nat. Rev. Methods Primers* 1 (1). <https://doi.org/10.1038/s43586-021-00055-w>.
- Cacioppo, J.T., Cacioppo, S., 2018. Loneliness in the modern age: an evolutionary theory of loneliness (ETL). In: *Advances in Experimental Social Psychology*, pp. 127–197. <https://doi.org/10.1016/bs.aesp.2018.03.003>.
- Cacioppo, J.T., Hawkley, L.C., 2009. Perceived social isolation and cognition. *Trends Cogn. Sci.* 13 (10), 447–454. <https://doi.org/10.1016/j.tics.2009.06.005>.
- Cacioppo, J.T., Hawkley, L.C., Ernst, J.M., Burleson, M., Bernston, G.G., Nouriani, B., Spiegel, D., 2006a. Loneliness within a nomological net: an evolutionary perspective. *J. Res. Pers.* 40 (6), 1054–1085. <https://doi.org/10.1016/j.jrp.2005.11.007>.
- Cacioppo, J.T., Hughes, M.E., Waite, L.J., Hawkley, L.C., Thisted, R.A., 2006b. Loneliness as a specific risk factor for depressive symptoms: cross-sectional and longitudinal analyses. *Psychol. Aging* 21 (1), 140–151. <https://doi.org/10.1037/0882-7974.21.1.140>.
- Clark, D.M., Wells, A., 1995. A cognitive model of social phobia. In: Heimberg, R.G., Liebowitz, M.R., Hope, D.A., Schneier, F.R. (Eds.), *Social Phobia: Diagnosis, Assessment, and Treatment*. The Guilford Press, pp. 69–93.
- Clauss, J.A., Blackford, J.U., 2012. Behavioral inhibition and risk for developing social anxiety disorder: a meta-analytic study. *J. Am. Acad. Child Adolesc. Psychiatry* 51 (10), 1066–1075.e1. <https://doi.org/10.1016/j.jaac.2012.08.002>.
- Danneel, S., Nelemans, S., Spithoven, A., Bastin, M., Bijttebier, P., Colpin, H., Van Den Noortgate, W., Van Leeuwen, K., Verschueren, K., Goossens, L., 2019. Internalizing problems in adolescence: linking loneliness, social anxiety symptoms, and depressive symptoms over time. *J. Abnorm. Child Psychol.* 47 (10), 1691–1705. <https://doi.org/10.1007/s10802-019-00539-0>.
- De Jong Gierveld, J., Van Tilburg, T., 2006. A 6-item scale for overall, emotional, and social loneliness. *Res. Aging* 28 (5), 582–598. <https://doi.org/10.1177/0164027506289723>.
- De Jong-Gierveld, J., Kamphuis, F., 1985. The development of a Rasch-type loneliness scale. *Appl. Psychol. Meas.* 9 (3), 289–299. <https://doi.org/10.1177/014662168500900307>.
- Diehl, K., Jansen, C., Ishchanova, K., Hilger-Kolb, J., 2018. Loneliness at universities: determinants of emotional and social loneliness among students. *Int. J. Environ. Res. Public Health* 15 (9), 1865. <https://doi.org/10.3390/ijerph15091865>.
- DiTommaso, E., Spinner, B., 1993. The development and initial validation of the Social and Emotional Loneliness Scale for Adults (SELSA). *Personal. Individ. Differ.* 14 (1), 127–134. [https://doi.org/10.1016/0191-8869\(93\)90182-3](https://doi.org/10.1016/0191-8869(93)90182-3).
- DiTommaso, E., Brannen-McNulty, C., Ross, L., Burgess, M., 2002. Attachment styles, social skills and loneliness in young adults. *Personal. Individ. Differ.* 35 (2), 303–312. [https://doi.org/10.1016/s0191-8869\(02\)00190-3](https://doi.org/10.1016/s0191-8869(02)00190-3).
- Domènech-Abella, J., Domènech, C., 2024. Chronic and transient loneliness in western countries: risk factors and association with depression. A follow-up study. *Eur. Psychiatry* 67 (S1), S334. <https://doi.org/10.1192/j.eurpsy.2024.691>.
- Epskamp, S., Borsboom, D., Fried, E.I., 2018. Estimating psychological networks and their accuracy: a tutorial paper. *Behav. Res. Methods* 50 (1), 195–212. <https://doi.org/10.3758/s13428-017-0862-1>.
- Epskamp, S., Fried, E.I., 2018. A tutorial on regularized partial correlation networks. *Psychol. Methods* 23 (4), 617–634. <https://doi.org/10.1037/met0000167>.
- Erzen, E., Çikrikci, Ö., 2018. The effect of loneliness on depression: a meta-analysis. *Int. J. Soc. Psychiatry* 64 (5), 427–435. <https://doi.org/10.1177/0020764018776349>.
- Evans, O., Cruwys, T., Cárdenas, D., Wu, B., Cognition, A.V., 2022. Social identities mediate the relationship between isolation, life transitions, and loneliness. *Behav. Chang.* 39 (3), 191–204. <https://doi.org/10.1017/bec.2022.15>.
- Fournier, M.A., David, D.S.M., Zuroff, D.C., 2010. Origins and applications of the interpersonal circumplex. In: Horowitz, L.M., Strack, S. (Eds.), *Handbook of Interpersonal Psychology: Theory, Research, Assessment, and Therapeutic Interventions*. John Wiley & Sons, pp. 57–73. <https://doi.org/10.1002/9781118001868.ch4>.
- Fung, K., Paterson, D., Alden, L.E., 2017. Are social anxiety and loneliness best conceptualized as a unitary trait? *J. Soc. Clin. Psychol.* 36 (4), 335–345. <https://doi.org/10.1521/jscp.2017.36.4.335>.
- Gilbert, P., Allan, S., 1998. The role of defeat and entrapment (arrested flight) in depression: an exploration of an evolutionary view. *Psychol. Med.* 28 (3), 585–598. <https://doi.org/10.1017/s0033291798006710>.
- Griese, E.R., Buhs, E.S., 2013. Prosocial behavior as a protective factor for children's peer victimization. *J. Youth Adolesc.* 43 (7), 1052–1065. <https://doi.org/10.1007/s10964-013-0046-y>.
- Grygiel, P., Dolata, R., Humenny, G., Muszyński, M., 2023. Depressive symptoms and loneliness among early adolescents: a psychometric network analysis approach. *J. Child Psychol. Psychiatry* 65 (2), 199–214. <https://doi.org/10.1111/jcpp.13876>.
- Haslbeck, J.M.B., Waldorp, L.J., 2020. Mgm: estimating time-varying mixed graphical models in high-dimensional data. *J. Stat. Softw.* 93 (8). <https://doi.org/10.18637/jss.v093.i08>.
- Hawkley, L.C., Cacioppo, J.T., 2010. Loneliness matters: a theoretical and empirical review of consequences and mechanisms. *Ann. Behav. Med.* 40 (2), 218–227. <https://doi.org/10.1007/s12160-010-9210-8>.
- Hawkley, L.C., Preacher, K.J., Cacioppo, J.T., 2010. Loneliness impairs daytime functioning but not sleep duration. *Health Psychol.* 29 (2), 124–129. <https://doi.org/10.1037/a0018646>.
- Heinrich, L.M., Gullone, E., 2006. The clinical significance of loneliness: a literature review. *Clin. Psychol. Rev.* 26 (6), 695–718. <https://doi.org/10.1016/j.cpr.2006.04.002>.
- Hofstra, J., 2009. *Attaching Cultures: The Role of Attachment Styles in Explaining Majority Members' Acculturation Attitudes* (Doctoral dissertation). University of Groningen. <https://www.researchgate.net/publication/50843979>.
- Horowitz, L.M., de Sales French, R., 1979. Interpersonal problems of people who describe themselves as lonely. *J. Consult. Clin. Psychol.* 47 (4), 762–764. <https://doi.org/10.1037//0022-006x.47.4.762>.
- Hyland, P., Shevlin, M., Cloitre, M., Karatzias, T., Vallières, F., McGinty, G., Fox, R., Power, J.M., 2018. Quality not quantity: loneliness subtypes, psychological trauma, and mental health in the US adult population. *Soc. Psychiatry Psychiatr. Epidemiol.* 54 (9), 1089–1099. <https://doi.org/10.1007/s00127-018-1597-8>.

- Isvoranu, A., Epskamp, S., 2021. Which estimation method to choose in network psychometrics? Deriving guidelines for applied researchers. *Psychol. Methods* 28 (4), 925–946. <https://doi.org/10.1037/met0000439>.
- Jaremka, L.M., Andridge, R.R., Fagundes, C.P., Alfano, C.M., Pivoski, S.P., Lipari, A.M., Agnese, D.M., Arnold, M.W., Farrar, W.B., Yee, L.D., Carson III, W.E., Bekaii-Saab, T., Martin Jr., E.W., Schmidt, C.R., Kiecolt-Glaser, J.K., 2014. Pain, depression, and fatigue: loneliness as a longitudinal risk factor. *Health Psychol.* 33 (9), 948–957. <https://doi.org/10.1037/a0034012>.
- Jeyagowri, K., Iankumaran, M., 2018. The role of students in transition from school to college: different challenges in Elt. *Int. J. Eng. Technol.* 7 (4.36), 630–635. <https://doi.org/10.14419/ijet.v7i4.36.24213>.
- Kim, K., Chang, S.M., Hahm, B., Kim, B., 2024. Association of loneliness with mental disorders in Korean adults: national mental health survey of Korea 2021. *Soc. Psychiatry Psychiatr. Epidemiol.* 59 (12), 2145–2153. <https://doi.org/10.1007/s00127-024-02702-5>.
- Kirwan, E.M., O'Suilleabháin, P.S., Burns, A., Ogoro, M., Allen, E., Creaven, A., 2023. Exploring loneliness in emerging adulthood: a qualitative study. *Emerg. Adulthood* 11 (6), 1433–1445. <https://doi.org/10.1177/21676968231194380>.
- Koelen, J.A., Mansueto, A.C., Finneemann, A., De Koning, L., Van Der Heijde, C.M., Vonk, P., Wolters, N.E., Klein, A., Epskamp, S., Wiers, R.W., 2021. COVID-19 and mental health among at-risk university students: a prospective study into risk and protective factors. *Int. J. Methods Psychiatr. Res.* 31 (1). <https://doi.org/10.1002/mpr.1901>.
- Koepke, S., Denissen, J.J., 2012. Dynamics of identity development and separation–individuation in parent–child relationships during adolescence and emerging adulthood – a conceptual integration. *Dev. Rev.* 32 (1), 67–88. <https://doi.org/10.1016/j.dr.2012.01.001>.
- Kupper, N., Denollet, J., 2013. Type D personality is associated with social anxiety in the general population. *Int. J. Behav. Med.* 21 (3), 496–505. <https://doi.org/10.1007/s12529-013-9350-x>.
- Ladd, G.W., Ettekal, I., 2013. Peer-related loneliness across early to late adolescence: normative trends, intra-individual trajectories, and links with depressive symptoms. *J. Adolesc.* 36 (6), 1269–1282. <https://doi.org/10.1016/j.adolescence.2013.05.004>.
- Lim, M.H., Rodebaugh, T.L., Zypur, M.J., Gleeson, J.F., 2016. Loneliness over time: the crucial role of social anxiety. *J. Abnorm. Psychol.* 125 (5), 620–630. <https://doi.org/10.1037/abn0000162>.
- Lim, M.H., Manera, K.E., Owen, K.B., Phongsavan, P., Smith, B.J., 2023. The prevalence of chronic and episodic loneliness and social isolation from a longitudinal survey. *Sci. Rep.* 13 (1). <https://doi.org/10.1038/s41598-023-39289-x>.
- Luo, M., 2022. Social isolation, loneliness, and depressive symptoms: a twelve-year population study of temporal dynamics. *J. Gerontol. B* 78 (2), 280–290. <https://doi.org/10.1093/geronb/gbac174>.
- Maes, M., Nelemans, S.A., Danneel, S., Fernández-Castilla, B., Van den Noortgate, W., Goossens, L., Vanhalst, J., 2019. Loneliness and social anxiety across childhood and adolescence: multilevel meta-analyses of cross-sectional and longitudinal associations. *Dev. Psychol.* 55 (7), 1548–1565. <https://doi.org/10.1037/dev0000719>.
- Majorano, M., Musetti, A., Brondino, M., Corsano, P., 2015. Loneliness, emotional autonomy and motivation for solitary behavior during adolescence. *J. Child Fam. Stud.* 24 (11), 3436–3447. <https://doi.org/10.1007/s10826-015-0145-3>.
- Masi, C.M., Chen, H., Hawkey, L.C., Cacioppo, J.T., 2010. A meta-analysis of interventions to reduce loneliness. *Personal. Soc. Psychol. Rev.* 15 (3), 219–266. <https://doi.org/10.1177/1088868310377394>.
- Mattick, R.P., Clarke, J.C., 1998. Development and validation of measures of social phobia scrutiny fear and social interaction anxiety. *Behav. Res. Ther.* 36 (4), 455–470. [https://doi.org/10.1016/s0005-7967\(97\)10031-6](https://doi.org/10.1016/s0005-7967(97)10031-6).
- McEwan, K., Gilbert, P., Duarte, J., 2011. An exploration of competitiveness and caring in relation to psychopathology. *Br. J. Clin. Psychol.* 51 (1), 19–36. <https://doi.org/10.1111/j.2044-8260.2011.02010.x>.
- Menzies, J., Baron, R., 2013. International postgraduate student transition experiences: the importance of student societies and friends. *Innov. Educ. Teach. Int.* 51 (1), 84–94. <https://doi.org/10.1080/14703297.2013.771972>.
- Nakao, M., Shirotaki, K., Sugaya, N., 2021. Cognitive-behavioral therapy for management of mental health and stress-related disorders: recent advances in techniques and technologies. *Biopsychosoc. Med.* 15 (1). <https://doi.org/10.1186/s13030-021-00219-w>.
- Qualter, P., Vanhalst, J., Harris, R., Van Roekel, E., Lodder, G., Bangee, M., Maes, M., Verhagen, M., 2015. Loneliness across the life span. *Perspect. Psychol. Sci.* 10 (2), 250–264. <https://doi.org/10.1177/1745691615568999>.
- Radloff, L.S., 1977. The CES-D scale. *Appl. Psychol. Meas.* 1 (3), 385–401. <https://doi.org/10.1177/014662167700100306>.
- Ravikumar, P., Wainwright, M.J., Lafferty, J.D., 2010. High-dimensional Ising model selection using ℓ_1 -regularized logistic regression. *Ann. Stat.* 38 (3). <https://doi.org/10.1214/09-aos691>.
- Ren, L., Mo, B., Liu, J., Li, D., 2020. A cross-lagged regression analysis of loneliness and depression: a two-year trace. *Eur. J. Dev. Psychol.* 19 (2), 198–212. <https://doi.org/10.1080/17405629.2020.1865146>.
- Rotenberg, K.J., McDougall, P., Boulton, M.J., Vaillancourt, T., Fox, C., Hymel, S., 2004. Cross-sectional and longitudinal relations among peer-reported trustworthiness, social relationships, and psychological adjustment in children and early adolescents from the United Kingdom and Canada. *J. Exp. Child Psychol.* 88 (1), 46–67. <https://doi.org/10.1016/j.jecp.2004.01.005>.
- Santoro, G., Costanzo, A., Franceschini, C., Lenzo, V., Musetti, A., Schimmenti, A., 2024. Insecure minds through the looking glass: the mediating role of mentalization in the relationships between adult attachment styles and problematic social media use. *Int. J. Environ. Res. Public Health* 21 (3), 255. <https://doi.org/10.3390/ijerph21030255>.
- Schinka, K.C., Van Dulmen, M.H., Mata, A.D., Bossarte, R., Swahn, M., 2013. Psychosocial predictors and outcomes of loneliness trajectories from childhood to early adolescence. *J. Adolesc.* 36 (6), 1251–1260. <https://doi.org/10.1016/j.adolescence.2013.08.002>.
- Schofield, C.A., Coles, M.E., Gibb, B.E., 2009. Retrospective reports of behavioral inhibition and young adults' current symptoms of social anxiety, depression, and anxious arousal. *J. Anxiety Disord.* 23 (7), 884–890. <https://doi.org/10.1016/j.janxdis.2009.05.003>.
- Shorter, P., Turner, K., Mueller-Coyne, J., 2022. Attachment Style's impact on loneliness and the motivations to use social media. *Comput. Hum. Behav. Rep.* 7, 100212. <https://doi.org/10.1016/j.chbr.2022.100212>.
- Spence, R., Jacobs, C., Bifulco, A., 2018. Attachment style, loneliness and depression in older age women. *Aging Ment. Health* 24 (5), 837–839. <https://doi.org/10.1080/13607863.2018.1553141>.
- Spithoven, A.W., Bijttebier, P., Goossens, L., 2017. It is all in their mind: a review on information processing bias in lonely individuals. *Clin. Psychol. Rev.* 58, 97–114. <https://doi.org/10.1016/j.cpr.2017.10.003>.
- Sturman, E.D., Mongrain, M., 2007. The role of personality in defeat: a revised social rank model. *Eur. J. Personal.* 22 (1), 55–79. <https://doi.org/10.1002/per.653>.
- Ten Have, M.T., Tuithof, M., Van Dorsselaer, S., Schouten, F., Luijk, A.I., De Graaf, R., 2023. Prevalence and trends of common mental disorders from 2007–2009 to 2019–2022: results from the Netherlands Mental Health Survey and Incidence Studies (NEMESIS), including comparison of prevalence rates before vs. during the COVID-19 pandemic. *World Psychiatry* 22 (2), 275–285. <https://doi.org/10.1002/wps.21087>.
- Teo, A.R., Lerrigo, R., Rogers, M.A., 2013. The role of social isolation in social anxiety disorder: a systematic review and meta-analysis. *J. Anxiety Disord.* 27 (4), 353–364. <https://doi.org/10.1016/j.janxdis.2013.03.010>.
- Van Beljouw, I.M.J., Van Exel, E., De Jong Gierveld, J., Comijs, H.C., Heerings, M., Stek, M.L., Van Marwijk, H.W.J., 2014. “Being all alone makes me sad”: loneliness in older adults with depressive symptoms. *Int. Psychogeriatr.* 26 (9), 1541–1551. <https://doi.org/10.1017/s1041610214000581>.
- Van Oudenhoven, J.P.L.M., Hofstra, J., Bakker, W., 2003. Ontwikkeling en evaluatie van de Hechtingstijllijst [Development and evaluation of the Attachment Styles Questionnaire]. *Ned. Tijdschr. Psychol.* 58, 95–102.
- Van Tilburg, T.G., de Jong-Gierveld, J., 1999. Cesuurbepaling van de eenzaamheidsschaal. *Tijdschr. Gerontol. Geriatr.* 30, 158–163. <http://hdl.handle.net/1871/39713>.
- Vanhalst, J., Soenens, B., Luyckx, K., Van Petegem, S., Weeks, M.S., Asher, S.R., 2015. Why do the lonely stay lonely? Chronically lonely adolescents' attributions and emotions in situations of social inclusion and exclusion. *J. Pers. Soc. Psychol.* 109 (5), 932–948. <https://doi.org/10.1037/pspp0000051>.
- Waldorp, L., Haslbeck, J., 2024. Network inference with the lasso. *Multivar. Behav. Res.* 59 (4), 738–757. <https://doi.org/10.1080/00273171.2024.2317928>.
- Waytz, A., Chou, E.Y., Magee, J.C., Galinsky, A.D., 2015. Not so lonely at the top: the relationship between power and loneliness. *Organ. Behav. Hum. Decis. Process.* 130, 69–78. <https://doi.org/10.1016/j.obhdp.2015.06.002>.
- Wei, M., Vogel, D.L., Ku, T., Zakalik, R.A., 2005. Adult attachment, affect regulation, negative mood, and interpersonal problems: the mediating roles of emotional reactivity and emotional cutoff. *J. Couns. Psychol.* 52 (1), 14–24. <https://doi.org/10.1037/0022-0167.52.1.14>.
- Weiss, R.S., 1973. Loneliness: The Experience of Emotional and Social Isolation. M.I.T. Press.
- Werner, A.M., Tibubos, A.N., Müller, L.M., Reichel, J.L., Schäfer, M., Heller, S., Pfirrmann, D., Edelmann, D., Dietz, P., Rigotti, T., Beutel, M.E., 2021. The impact of lockdown stress and loneliness during the COVID-19 pandemic on mental health among university students in Germany. *Sci. Rep.* 11 (1). <https://doi.org/10.1038/s41598-021-02024-5>.
- Wiggins, J.S., 1991. Agency and communion as conceptual coordinates for the understanding and measurement of interpersonal behavior. In: Grove, W., Cicetti, D. (Eds.), *Thinking Clearly about Psychology: Essays In honor of Paul Everett Meehl, vol. 2*. University of Minnesota Press, pp. 89–113.
- Wolters, N.E., Mobach, L., Wuthrich, V.M., Vonk, P., Van Der Heijde, C.M., Wiers, R.W., Rapee, R.M., Klein, A.M., 2023. Emotional and social loneliness and their unique links with social isolation, depression and anxiety. *J. Affect. Disord.* 329, 207–217. <https://doi.org/10.1016/j.jad.2023.02.096>.