Identifying Robust Longitudinal Transactions Between Loneliness and the Big Five Personality Traits

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Abstract: Understanding when and why people become lonely is of theoretical and practical relevance. Personality traits and loneliness have been theorized to reciprocally influence each other over time. However, longitudinal research on personality-loneliness transactions remains scarce, yielded inconsistent findings, and shares methodological limitations. To advance understanding of the longitudinal transactions between loneliness and personality traits, the present study analyzed data from three nationally representative large-scale panel studies ($N = 63{,}555$). Meta-analytic aggregation of the findings across datasets showed that, at the within-person level, increases in extraversion ($\beta = -0.04$), conscientiousness ($\beta = -0.02$), and emotional stability ($\beta = -0.03$) predicted decreases in loneliness 4 years later. In turn, increases in loneliness predicted decreases in extraversion ($\beta = -0.03$), agreeableness ($\beta = -0.02$), conscientiousness ($\beta = -0.02$), and emotional stability ($\beta = -0.02$) 4 years later. Notably, effect sizes differed substantially across the individual datasets. Overall, the present findings highlight the dynamic relationship between loneliness and personality traits, indicating that traits not only shape but also adapt to changes in loneliness. Personality traits therefore represent an important factor in understanding, preventing, and reducing loneliness.

Keywords: loneliness, personality traits, big five, longitudinal, cross-lagged effects

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The Longitudinal Transactions Between Loneliness and the Big Five Personality Traits

Loneliness describes an adverse feeling of a perceived discrepancy between one's actual and desired social relationships (De Jong-Gierveld, 1987, 1989; Peplau & Perlman, 1982). It affects people at every age (e.g., Luhmann & Hawkley, 2016; Surkalim et al., 2022) and is associated with various mental and physical health conditions and mortality (e.g., J. T. Cacioppo & Cacioppo, 2014; Holt-Lunstad et al., 2015). Consequently, loneliness is considered a significant global health concern, and understanding the factors contributing to it is of critical relevance for research and practice (Hawkley, 2022).

One factor that may contribute to the development of loneliness are differences in personality traits (e.g., Barjaková et al., 2023), which have been found to shape people's social preferences and relationships (e.g., Back et al., 2023). In turn, loneliness may also contribute to changes in personality traits, for example, through maladaptive cognitions (e.g., J. T. Cacioppo & Hawkley, 2009). However, longitudinal research on the transactions between loneliness and personality traits is scarce. Moreover, the few existing longitudinal studies produced inconsistent findings, which may at least partly be explained by the use of different study designs and methodologies (e.g., Joshanloo, 2024; Mund & Neyer, 2016; Tapia-Munoz et al., 2024). As a result, it remains difficult to draw firm conclusions about personality-loneliness transactions over time.

To address this gap, the present study analyzed data from three nationally representative large-scale panel studies, focusing on the following two research questions: (1) Do changes in the Big Five predict subsequent changes in loneliness? (2) Do changes in loneliness predict subsequent changes in the Big Five? Integrating findings across multiple studies, we aimed to identify robust longitudinal transactions between loneliness and the Big Five personality traits.

Loneliness

Human survival has long depended on forming and maintaining social relationships (e.g., Baumeister & Leary, 1995; Bowlby, 1969). Loneliness is thought to have evolved as an aversive signal of insufficient social connection, motivating efforts to reconnect (J. T. Cacioppo, Hawkley, et al., 2006; J. T. Cacioppo et al., 2014). Importantly, loneliness can arise not only from a quantitative lack of social relationships but also when the quality of existing relationships are perceived as unsatisfying (e.g., J. T. Cacioppo et al., 2009; S. Cacioppo et al., 2015). It is therefore conceptually distinct from social isolation, which refers to the objective absence of social ties.

Although loneliness may have adaptive functions (J. T. Cacioppo, Hawkley, et al., 2006; J. T. Cacioppo et al., 2014), its widespread prevalence and negative consequences have led to concerns about its health and societal impacts (Hawkley, 2022; World Health Organization, 2023). For example, 13% of the population in the European Union and 21% of US inhabitants report experiencing loneliness frequently (Joint Research Centre, 2022; Making Caring Common, 2024). Furthermore, loneliness is associated with numerous mental and physical health conditions, including depressive symptoms (e.g., J. T. Cacioppo et al., 2010; Vanhalst et al., 2012), anxiety (e.g., Maes et al., 2019; Park et al., 2020), suicidality (e.g., Mereish et al., 2017; Park et al., 2020), cardiovascular diseases (Caspi et al., 2006; Holt-Lunstad et al., 2015), diminished immunity (e.g., Hawkley & Cacioppo, 2010; Pressman et al., 2005), cognitive decline (e.g., Lara et al., 2019; Sundström et al., 2020), and increased mortality (Holt-Lunstad et al., 2015). Consequently, understanding the factors that contribute to the development of loneliness is essential for effectively preventing and reducing it in the general population.

Loneliness and Personality Traits

Among the various factors thought to shape loneliness, personality traits have been considered a key factor. Defined as relatively enduring patterns of thought, feeling, and behavior that distinguish individuals from one another (Allport, 1961), personality traits may shape the quantity and quality of social interactions as well as individuals' perceptions of social relationships, thereby influencing vulnerability to loneliness (e.g., Back et al., 2023; Barjaková et al., 2023). At the same time, loneliness may also contribute to personality trait changes. Persistent feelings of loneliness can foster biased cognitions, negative affect, and social withdrawal, which in turn may lead to maladaptive shifts in personality (e.g., J. T. Cacioppo & Hawkley, 2009; Vanhalst et al., 2015). Understanding the longitudinal transactions between loneliness and personality traits is therefore of both theoretical and practical relevance. Such knowledge may help to identify unfavorable developmental trajectories, prevent vicious cycles between loneliness and personality change, and refine theories of both loneliness and personality development.

To date, most existing research on the relationship between loneliness and personality traits has focused on the Big Five personality traits—extraversion, agreeableness, conscientiousness, openness and emotional stability which offer a useful balance between conceptual breadth and descriptive fidelity (Bleidorn, 2024). In the following, we briefly outline how each of the Big Five traits is expected to be associated with the development of loneliness, and how loneliness, in turn, may be relevant for the development of the Big Five.

Loneliness and Extraversion

Individuals high in extraversion tend to be sociable, outgoing and more likely to initiate interactions and form friendships than people low in this trait (Costa & McCrae, 1992; Selfhout et al., 2010; Soto & John, 2017). They tend to be better liked (Back et al., 2011), experience less insecurity in social relationships (Deventer et al., 2019; Mund &

Neyer, 2014; Neyer & Lehnart, 2007), maintain higher-quality relationships (e.g., Dyrenforth et al., 2010; Festa et al., 2012; Solomon & Jackson, 2014), form closer friendships (e.g., Deventer et al., 2019; Mund & Neyer, 2014; Wagner et al., 2014), and have larger social networks (Anderson et al., 2001; Asendorpf & Wilpers, 1998; Stokes, 1985). Thus, increases in extraversion may be associated with decreases in loneliness by enhancing both the quantity and quality of social relationships. Conversely, lonely individuals tend to exhibit dysfunctional cognitions, such as negative social expectations and a hypervigilance to social threats, which may cause social withdrawal (e.g., J. T. Cacioppo et al., 2015; J. T. Cacioppo & Hawkley, 2009; Spithoven et al., 2017). Therefore, increases in loneliness may also be associated with decreases in extraversion over time via these negative cognitions and social withdrawal.

Loneliness and Agreeableness

Agreeableness is characterized by warmth, empathy and forgiveness (Costa & McCrae, 1992; Soto & John, 2017). Agreeable individuals tend to be more popular (Cuperman & Ickes, 2009), have higher-quality relationships (Dyrenforth et al., 2010; Festa et al., 2012; Solomon & Jackson, 2014), experience more closeness (e.g., Deventer et al., 2019; Mund & Neyer, 2014; Wagner et al., 2014), and resolve conflicts more constructively (e.g., Berry et al., 2000; Festa et al., 2012; Mund & Neyer, 2014). As such, increases in agreeableness may be linked to decreases in loneliness trough an improvement in the quantity and quality of social relationships. Conversely, loneliness was found to be associated with distrust and hostility (e.g., J. T. Cacioppo et al., 2014, 2015; Langenkamp, 2023). Increases in loneliness may thus predict decreases in agreeableness over time.

Loneliness and Conscientiousness

Conscientious individuals tend to be organized, efficient and keep things neat and tidy (Costa & McCrae, 1992; Soto & John, 2017). Conscientiousness has been found to be

associated with higher relationship quality (Berry et al., 2000; Dyrenforth et al., 2010; Solomon & Jackson, 2014), more emotional support (Berry et al., 2000; Festa et al., 2012), less insecurity (Deventer et al., 2019; Mund & Neyer, 2014), and a more productive conflict style (Berry et al., 2000; Deventer et al., 2019; Festa et al., 2012). Given these benefits, particularly for the quality of social relationships, increases in conscientiousness may be linked to decreases in loneliness. On the other hand, loneliness has been associated with poorer executive functioning and lower self-regulation (Baumeister et al., 2005; J. T. Cacioppo & Hawkley, 2009; Campbell et al., 2006). Therefore, it is also possible that increases in loneliness are associated with decreases in conscientiousness.

Loneliness and Openness

Openness is characterized by creativity and curiosity (Costa & McCrae, 1992; Soto & John, 2017). Although individuals high in openness tend to have larger social networks and demonstrate better conflict management (e.g., Harris & Vazire, 2016), openness is often characterized as an intrapsychic rather than an interpersonal trait (McCrae, 1996). Consistent with this view, empirical findings have frequently shown weak, mixed, or nonsignificant associations between openness and social relationships (e.g., Deventer et al., 2019; Mund & Neyer, 2014; Orth, 2013; Solomon & Jackson, 2014). Accordingly, there is little theoretical or empirical basis for expecting robust reciprocal associations between openness and loneliness.

Loneliness and Emotional Stability

Emotionally stable individuals rarely feel anxious or worried and handle stress well. (Costa & McCrae, 1992; Soto & John, 2017). They tend to have more friends (e.g., Demir & Weitekamp, 2007; Kang, 2023; Neyer & Lehnart, 2007), experience less insecurity in social relationships (Deventer et al., 2019; Mund & Neyer, 2014; Neyer & Lehnart, 2007), have a more productive conflict style (e.g., Deventer et al., 2019; Festa et al., 2012; Wagner et al.,

2014), report better relationship quality (e.g., Dyrenforth et al., 2010; Solomon & Jackson, 2014; Wagner et al., 2014), and experience a lower risk of relationship dissolution (Solomon & Jackson, 2014; Soto, 2019). Additionally, emotional stability has been found to be associated with greater interpersonal trust (Evans & Revelle, 2008; Schunk & Trommsdorff, 2022), lower sensitivity to social threats (Denissen & Penke, 2008), lower emotional reactivity (e.g., Hisler et al., 2020; Mader et al., 2023; Zautra et al., 2005), and greater use of adaptive emotion regulation strategies (Barańczuk, 2019). Thus, increases in emotional stability may contribute to decreases in loneliness by enhancing both the quantity and quality of social relationships, as well as by positively influencing how individuals perceive and respond to changes in these relationships.

In contrast, increases in loneliness may contribute to decreases in emotional stability through kindling effects that, similar to depressive episodes, leave lasting "scars" on an individual's personality (Monroe & Harkness, 2005; Zeiss & Lewinsohn, 1988), such as decreases in emotional stability (Kendler, 1993; Klein et al., 2002; Ormel et al., 2001). As loneliness and depression are reciprocally related (J. T. Cacioppo, Hughes, et al., 2006; Hawkley & Cacioppo, 2010; Vanhalst et al., 2012), episodes of increased loneliness could similarly contribute to decreases in emotional stability (Mund & Neyer, 2016, 2019).

Existing Evidence on the Relationship between Loneliness and Personality Traits

Several cross-sectional studies have examined the links between loneliness and the Big Five personality traits. In a recent meta-analysis, Buecker et al. (2020) found that loneliness was negatively associated with all Big Five traits: extraversion ($r = -.37$), agreeableness ($r = -.24$), openness ($r = -.11$), conscientiousness ($r = -.20$), and emotional stability ($r = -.36$). Except for openness, these associations remained significant even after controlling for the other Big Five traits. However, as these findings are based on cross-

sectional data, they provide no insights into the theorized transactions between loneliness and the Big Five personality traits over time, pointing to the necessity for longitudinal research.

Longitudinal research on the relationship between loneliness and the Big Five personality traits is scarce (see Table 1 for an overview of previous longitudinal studies). Moreover, although most studies converge on the finding that higher emotional stability negatively predicts later loneliness, and vice versa (e.g., Abdellaoui et al., 2019; Mund & Neyer, 2016; Schunk & Trommsdorff, 2022), findings are inconsistent for the other Big Five traits. For example, while some studies found that extraversion negatively predicted later loneliness (Joshanloo, 2024; Tapia-Munoz et al., 2024; Wu et al., 2024), others found no significant effects (Mund & Neyer, 2016; Ormstad et al., 2020; Wieczorek et al., 2021). Similarly, while one study reported that loneliness predicted subsequent decreases in extraversion, (Joshanloo, 2024), another found the opposite (Mund & Neyer, 2019), and yet another found no significant effect of loneliness on later changes in extraversion (Mund & Neyer, 2016).

In addition to these inconsistencies, prior longitudinal research on the relationship between loneliness and the Big Five personality traits over time shares at least three limitations. First, studies have differed in research design (e.g., assessment intervals) and statistical approaches, which complicates the comparison of results and potentially has contributed to the diverging findings. Second, approximately one third of the longitudinal studies conducted so far have focused on just a single Big Five trait, most commonly emotional stability. As a result, our understanding of the relationship between loneliness and all Big Five personality traits over time remains incomplete. Additionally, this risks that some effects for certain Big Five traits are overlooked, while others are overemphasized. Third, the majority of previous longitudinal studies only focused on the effects of the Big Five traits on

the development of loneliness but did not consider effects of loneliness on these traits, neglecting the potential of a reciprocal relationship between loneliness and the Big Five.

In summary, robust longitudinal evidence on the relationship between loneliness and the Big Five personality traits over time is lacking. Given the inconclusive findings of previous research, it remains unclear which longitudinal transactions between loneliness and the Big Five traits are replicable.

Table 1

Longitudinal Studies of the Relationship Between Loneliness and the Big Five Personality Traits

Study	Study characteristics						Relationship				
	Method	Dataset	N	M_{age}	% Female	Time lag in years	Extraversion	Openness	Agreeableness	Conscientiousness	Emotional stability
Big Five → Loneliness											
Mund &Neyer (2016)	Lagged regression models	Ad-hoc	654	24	54	15	0		0	0	−
Mund &Neyer (2016)	Latent change models	Ad-hoc	654	24	54	15	0		0	0	−
Abdellaoui et al. (2019)	Cross-lagged panel models	NTR	15,628			4–5					−
Ormstad et al. (2020)	Logistic regression	NorLAG	419	68	100	5	0	0	+	0	0
Ormstad et al. (2020)	Logistic regression	NorLAG	516	68	0	5	0	0	−	−	−
von Soest et al. (2020)	Latent change score models	NorLAG	5,555	58	51	5	−	0	0	0	−
Wieczorek et al. (2021)	Information-polynomial regression	pairfam	346	17	50	1	0				−
Wieczorek et al. (2021)	Information-polynomial regression	SELFIE	237	18	76	1	0				0
Schunk & Trommsdorf (2022)	Cross-lagged panel models	SOEP	11,079	53	54	4–5					−
Schunk & Trommsdorf (2022)	Random-intercept cross-lagged panel models	SOEP	5,663–7,217			4–5					−
Tapia-Munoz et al. (2024)	Linear mixed effects models	ELSA	4,892	68	55	8	−	0	0	0	0
Yu et al. (2023)	Mediation models	Ad-hoc	739	18	72	3					−
Joshanloo (2024)	Random-intercept cross-	HRS	9671	65	59	4	−	−	−	−	−

Study	Model	Source	N								
	lagged panel models										
Wu et al. (2024)	Growth mixture models & logistic regression	Ad-hoc	702	9	46	3	–				–
Loneliness → Big Five											
Mund &Neyer (2016)	Lagged regression models	Ad-hoc	654	24	54	15	–		0	–	–
Mund &Neyer (2016)	Latent change models	Ad-hoc	654	24	54	15	0		0	–	–
Abdellaoui et al. (2019)	Cross-lagged panel models	NTR	15,628			4–5					–
Mund &Neyer (2019)	Lagged regression models	pairfam	12,402	26	51	5	–	0	–	–	+
Mund &Neyer (2019)	Latent change models	pairfam	12,402	26	51	5	+	0	0	0	–
Schunk & Trommsdorf (2022)	Cross-lagged panel models	SOEP	11,079	53	54	4–5					–
Schunk & Trommsdorf (2022)	Random-intercept cross-lagged panel models	SOEP	5,663–7,217			4–5					–
Joshanloo (2024)	Random-intercept cross-lagged panel models	HRS-A	9671	65	59	4	–	0	–	–	0

Note. The table summarizes statistical modeling approaches, sample characteristics, time lags between assessment waves, and findings from previous longitudinal studies examining the relationship between loneliness and the Big Five personality traits. The upper panel presents studies that examined whether personality traits predict subsequent loneliness (Big Five → Loneliness), whereas the lower panel presents studies that tested whether loneliness predicts subsequent personality traits (Loneliness → Big Five). A "+" indicates a significant positive longitudinal association between loneliness and a Big Five trait, a "–" indicates a significant negative longitudinal association between loneliness and a Big Five trait, and "0" denotes no significant effect. An empty cell indicates that no information was provided for the corresponding relationship or that the relationship was not assessed in the study. NTR = Netherlands Twin Register; NorLag = Norwegian Life Course, Ageing and Generation Study; pairfam = Panel Analysis of Intimate Relationships and Family Dynamics; SOEP = Socio-Economic Panel; HRS-A

= Subsample A of the Health and Retirement Study; ELSA = English Longitudinal Study of Ageing; We did not include longitudinal research examining loneliness-personality transactions in context of the COVID-19 pandemic (Alt et al., 2021; Mansour et al., 2021) because we were interested in general transactional patterns.

The Present Study

The present study examined the longitudinal transactions between loneliness and the Big Five personality traits in four datasets from three nationally representative, large-scale panel studies. Specifically, we first examined within-person cross-lagged effects between loneliness and the Big Five traits over time separately in each of the four datasets using random-intercept cross-lagged panel models (RI-CLPMs; Hamaker et al., 2015), and then. aggregated the resulting estimates using fixed-effects meta-analyses. Additionally, we explored variations in findings across datasets. This study addressed two core research questions: (1) Do changes in the Big Five predict subsequent changes in loneliness? (2) Do changes in loneliness predict subsequent changes in the Big Five? Drawing on theoretical considerations and prior research, six preregistered hypotheses were formulated and tested regarding the relationship between loneliness and the three Big Five traits with the most consistent evidence: at the within-person level, increases in extraversion (H1.1), conscientiousness (H2.1) and emotional stability (H3.1) predict subsequent decreases in loneliness, and vice versa—that is, increases in loneliness predict subsequent decreases in these traits (H1.2, H2.2, H3.2).

Method

Transparency and Openness

The present study was preregistered here. A codebook, analysis scripts, and supplemental materials can be retrieved from OSF. Deviations from the preregistration are described in the supplemental materials. The data used for this study could not be uploaded to OSF due to legal constraints. However, researchers can request access to the data by signing user contracts with the respective panel providers (see below for details). We report how we determined our sample size, all data exclusions, all manipulations, and all measures in this study.

Participants and Procedures

To identify robust longitudinal transactions between loneliness and the Big Five personality traits, we used data from three nationally representative panel studies: (1) the Household, Income and Labour Dynamics in Australia Survey (HILDA; Watson & Wooden, 2012), (2) the Health and Retirement Study (HRS; Juster & Suzman, 1995) and (3) the Longitudinal Internet Panel for the Social Sciences (LISS; Scherpenzeel & Das, 2010). These panels were selected because they used (a) random sampling methods, (b) assessed loneliness and the Big Five traits with the same measures in at least three waves, and (c) allowed us to examine loneliness-personality transactions over consistent retest intervals.

Household, Income and Labour Dynamics in Australia (HILDA)

HILDA is an ongoing longitudinal panel study conducted with individuals residing in Australian households. Data collection began in 2001, with annual assessments. Refresher samples are periodically added to the panel. Data access can be requested here and prior publications relying on the HILDA dataset can be found here. The present study used Release 23.

Health and Retirement Study (HRS)

HRS is an ongoing longitudinal panel study conducted in the United States, assessing individuals aged 50 and older. Initiated in 1992, data is collected biennially. Since 2006, psychosocial and lifestyle data, including loneliness and the Big Five traits, have been collected from participants through self-administered questionnaires (SAQ) in a 4-year cycle with a rotating design. Specifically, in 2006, a random 50% of the sample—Subsample A (HRS-A)—was selected to complete the Psychosocial and Lifestyle SAQ, with subsequent administrations in 2010, 2014, 2018 and 2022. The remaining 50% of the sample—Subsample B (HRS-B)—was scheduled to complete the same SAQ in 2008, 2012, 2016, and 2020. Given the differences in assessment waves and assessment instruments (see Table 2),

the two subsamples were analyzed separately in the present study. Data access can be requested here and prior publications relying on the HRS dataset can be found here. The present study used the HRS 2022 Core and the RAND Longitudinal File 2020[1].

Longitudinal Internet Panel for the Social Sciences (LISS)

LISS is an ongoing panel study conducted in the Netherlands and assesses individuals residing in Dutch households. Data collection began in 2007, with annual assessments. Both loneliness and the Big Five traits were measured annually starting in 2007. Refresher samples are periodically added to the panel. Data access can be requested here and prior publications relying on the LISS dataset can be found at here. The present study used data collected until June 2024.

Measures

The frequency of assessments and the measurement instruments differed across the three panel studies. Table 2 provides an overview of the available assessment waves and the measurement characteristics for loneliness and the Big Five personality traits within each panel. Further details on the extracted variables are available in the codebook.

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[1] The RAND HRS Longitudinal File is an easy-to-use dataset based on the HRS core data. This file was developed at RAND with funding from the National Institute on Aging and the Social Security Administration.

Table 2

Overview of Loneliness and Big Five Personality Traits Assessments Across Panel Studies

Panel	Assessment waves		Measure	# of items	Notes
	#	Years			
Loneliness					
HILDA	23	2001–2023	Single item	1	Only the five waves in which the Big Five traits were measured were included in the analysis.
HRS-A	5	2006, 2010, 2014, 2018, 2022	11-item version of the R-UCLA Loneliness Scale (Russell, 1996)	3–11	Number of items varied across waves. Only the three items that were consistent across waves were included in the analysis.
HRS-B	4	2008, 2012, 2016, 2020	11-item version of the R-UCLA Loneliness Scale (Russell, 1996)	8–11	Number of items varied across waves. Only the eight items that were consistent across waves were included in the analysis.
LISS	16	2008-2023	6-item version of the De Jong Gierveld Loneliness Scale (De Jong Gierveld & Van Tilburg, 2006; de Jong Gierveld & van Tilburg, 2010)	6	Due to the use of a different response scale for loneliness in 2012, loneliness data from that wave was excluded from the analysis.
Big Five personality traits					
HILDA	5	2005, 2009, 2013, 2017, 2021	Adjective approach based on Saucier (1994) and Goldberg (1992)	36	Only the 28 items recommended in the user manual (Summerfield et al., 2024) were included in the analysis.
HRS-A	5	2006, 2010, 2014, 2018, 2022	26-item Midlife Development Inventory Personality Scale (MIDI; Lachman & Weaver, 1997) and 5 items from the International Personality Item Pool (IPIP; Goldberg, 1992)	26–31	Number of items varied between Big Five traits and across waves. Only the 26 items that were consistent across waves were included in the analysis.
HRS-B	4	2008, 2012, 2016, 2020	26-item Midlife Development Inventory Personality Scale (MIDI; Lachman & Weaver, 1997) and 5 items from the International Personality Item Pool (IPIP; Goldberg, 1992)	26–31	Number of items varied between Big Five traits and across waves. Only the 26 items that were consistent across waves were included in the analysis.
LISS	16	2008–2024	50-item version of the International Personality Item Pool (IPIP; Goldberg, 1992)	50	

Statistical Analysis

Data analyses were conducted using R (Version 4.4.1; R Core Team, 2024) and comprised three steps. First, the data were prepared and harmonized across the three panel studies. Second, RI-CLPMs (Hamaker et al., 2015) were estimated to investigate within-person cross-lagged effects between loneliness and each Big Five trait within each dataset. Third, these cross-lagged effects were aggregated across datasets using fixed-effects meta-analysis to test the formulated hypotheses and to identify robust longitudinal transactions between loneliness and the Big Five.

Step 1: Data Preparation

In a first step, relevant variables were extracted and prepared in a consistent way across the three panels. This involved (1) assigning consistent variable names, (2) reverse-scoring items when necessary, (3) calculating mean scores for multi-item measures, (4) dummy-coding the gender variable with consistent levels, (5) excluding participants who did not provide data on loneliness and at least one Big Five trait in at least one wave, and (6) imputing missing age and gender in a given wave using data from the participant's other waves. Additionally, two panel-specific preparations were performed. First, the HRS panel was split into two separate datasets corresponding to its two subsamples, HRS-A and HRS-B, due to differences in assessment waves and loneliness assessments. Second, the LISS panel was filtered to include only three waves spaced 4 years apart. This step was taken to align with the 4-year intervals of HILDA and HRS. Because time-lagged effects in RI-CLPMs depend on the time interval between assessment waves (e.g., Driver, 2025; Hamaker et al., 2015; Mulder & Hamaker, 2021a), maintaining a consistent interval across all datasets is essential for meaningful comparison and aggregation of findings. For each participant in the LISS panel, we thus identified the combination of three waves with a 4-year time lag that

contained the fewest missing values[2]. Sample characteristics of the four resulting datasets

after applying these data preparation steps are presented in Table 3.

Table 3

Sample Characteristics Across Datasets After Data Preparation

Panel	# of waves	N	Mean age (SD)	% Female
HILDA	5	24,487	33.37 (20.74)	52.33
HRS-A	5	12,976	64.56 (13.40)	58.20
HRS-B	4	11,156	66.24 (12.83)	58.35
LISS	3	14,936	42.97 (18.78)	54.80
Total		63,555	47.76 (22.73)	55.17

Note. The table summarizes sample characteristics of each dataset at the first measurement wave after applying the data

preparation steps. N = number of individuals. SD = Standard deviation.

## *Step 2: Examination of Longitudinal Transactions using RI-CLPMs*

In a second step, one RI-CLPM (Hamaker et al., 2015) for each *Loneliness* x *Trait* x

Dataset combination was estimated using the *lavaan* package (Rosseel, 2012). RI-CLPMs are

well suited to examine the longitudinal transactions between loneliness and the Big Five traits

as they distinguish between stable between-person differences and within-person change over

time (Hamaker et al., 2015; Mulder & Hamaker, 2021a). This distinction is achieved by

decomposing each observed score into two components: a random intercept that captures an

individual's time-invariant levels in a construct, and a within-person component that captures

an individual's wave-specific deviation from their stable between-person level.

Autoregressive and cross-lagged effects are then estimated based on these within-person

components. Cross-lagged effects were central to the present analysis, as they allowed for the

investigation of longitudinal transactions between loneliness and the Big Five personality

traits within each dataset. Cross-lagged effects reflect the prospective effect of a within-

person deviation from an individual's stable between-person level in one construct (e.g.,

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[2] We could not include more than three waves for the LISS panel because this resulted in a too low data coverage for estimating RI-CPLMs. However, in sensitivity analyses, we explored cross-lagged effects in the LISS panel across six assessment waves spaced 1 year apart.

emotional stability) at one time point on change in the within-person deviation in another construct (e.g., loneliness) at the subsequent time point (Orth et al., 2021).

　　　To facilitate comparison and aggregation of cross-lagged effects across the four datasets, they were standardized and constrained to be equal across time. To this end, we specified each RI-CLPM following the syntax provided by Mulder and Hamaker (2021a, 2021b) for constraining standardized time-lagged effects (see Figure 1). Specifically, random-intercepts were specified as latent variables using the corresponding observed scores of each variable across all waves as indicators with factor loadings fixed to 1. Within-person components were specified as latent variables using the corresponding observed scores at each wave as indicators with factor loadings freely estimated. Variances of the within-person components at the first wave were fixed to 1 and allowed to correlate. While residual variances, covariances and correlations of the within-person components at subsequent waves were freely estimated, their total variances were fixed to 1. Lastly, autoregressive and cross-lagged effects between the within-person components were specified for each pair of consecutive waves and constrained to be equal across time.

Figure 1

Illustration of a RI-CLPM for Loneliness and a Big Five Personality Trait
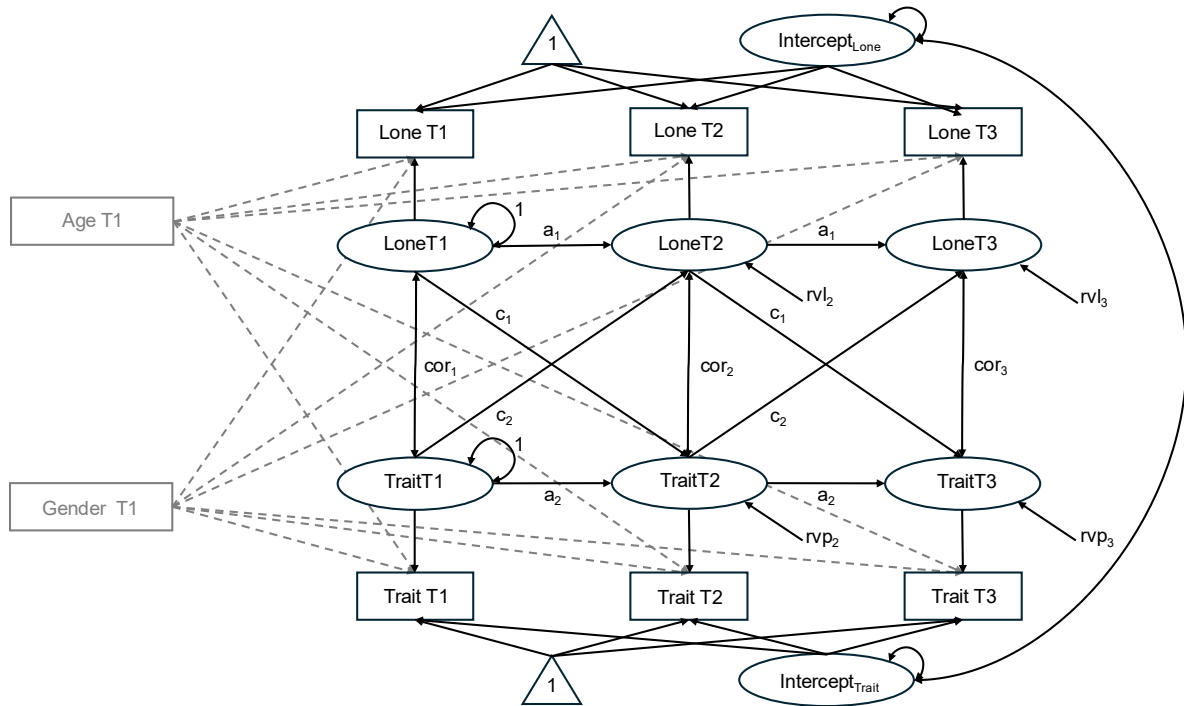
Note. The figure illustrates a three-wave RI-CLPM for loneliness (*Lone*) and one of the Big Five personality traits (*Trait*), as performed in the present study. Model specification followed the approach by Mulder and Hamaker (2021) for constraining standardized time-lagged effects to be equal across waves. $Intercept_{Lone}$ and $Intercept_{Trait}$ represent the random intercepts. *Lone* T1–3 and *Trait* T1–3 in the squares indicate the observed scores, whereas the corresponding ovals represent the latent within-person components. cor_{1-3} denote correlations between these within-person components at each wave. rvl_{2-3} and rvp_{2-3} represent their residual variances. The total variances of the within-person latent variables were fixed to 1. a_1 and a_2 indicate the autoregressive effects, while c_1 and c_2 represent the cross-lagged effects; both were constrained to be equal across waves. *Age* T1 and *Gender* T1 represent the two time-invariant control variables.

Age and gender have been found to confound the associations between loneliness and the Big Five traits (e.g., Buecker et al., 2020; Butkovic et al., 2012; Ormstad et al., 2020; Schunk & Trommsdorff, 2022). Therefore, each RI-CLPM included age and gender at the first wave of the respective dataset as time-invariant predictors of the observed variables. Additionally, due to the alignment of different waves during the data preparation, the date of assessment at the first wave was included as time-invariant predictor in the RI-CLPMs for the LISS dataset. Missing data was handled using full-information maximum likelihood (FIML) estimation in all RI-CLPMs.

Step 3: Meta-Analytic Aggregation

In a third step, the standardized cross-lagged effects estimated in Step 2 were aggregated using fixed-effects meta-analysis. This allowed for the examination of the robustness of effects across datasets and testing of the formulated hypotheses. Specifically, one fixed-effects meta-analysis for each *Loneliness* x *Trait* combination was performed using the *rma* function implemented in the *metafor* package (Viechtbauer, 2010). Fixed-effects meta-analysis was preferred over a random-effects meta-analysis, as estimating between-study heterogeneity is likely unreliable with only four effects per *Loneliness* x *Trait* combination (Borenstein et al., 2010; Dettori et al., 2022).

Sensitivity Analyses

In sensitivity analyses, we estimated additional RI-CLPMs based on different time lags between assessments. Specifically, we run RI-CLPMs with 1-year time intervals using the LISS data and 8-year time intervals using the HILDA and HRS data. These analyses allowed us to further test the robustness of effects and enabled the investigation of whether the size of cross-lagged effects increases or decreases over time.

For the LISS data, the sequence of six waves spaced 1-year apart with the least missing data on both loneliness and the Big Five was selected and aligned per participant[3]. Regarding HILDA and HRS-A, additional RI-CLPMs based on three waves spaced 8 years apart were estimated by analyzing every second wave.

Statistical Significance

Because the present study aimed to identify robust transactions between loneliness and the Big Five traits, a conservative significance level of $\alpha = .01$ was used for all analyses to reduce the risk of false positives. Using the *powRICLMP* package (Mulder, 2023), power analyses (see Section 1 of the supplemental materials) indicated that we could detect small cross-lagged effects in HILDA, HRS-A, and HRS-B and small-to-medium effects in LISS, with 80% power (Orth et al., 2024).[4]

Results

Descriptive statistics for each dataset are reported in Section 2 of the supplemental materials. Intercorrelations between loneliness and the Big Five personality traits within each dataset are presented in Section 3. Fit indices for the RI-CLPMs, random-intercept correlations and standardized auto-regressive effects are reported in Section 4. All RI-CPLMs demonstrated good to excellent fit (CFI = .96–.99, TLI = .95–.99, RMSEA = .02–.04, SRMR = .02–.04). Effect sizes were interpreted in accordance with the empirical benchmarks proposed by Orth et al. (2024): $\beta = 0.03$ (small), $\beta = 0.07$ (medium), and $\beta = 0.12$ (large).

Research Question 1: Do Intraindividual Changes in the Big Five Personality Traits Predict Subsequent Changes in Loneliness?

Standardized cross-lagged effects from changes in the Big Five traits on changes in loneliness in each of the four datasets and the meta-analytic aggregations are presented in

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[3] Sequences with more than six waves could not be considered in LISS due to insufficient data coverage for estimating the RI-CLPMs.
[4] These power analyses deviate from those specified in the preregistration, which did not account for standardized time-lagged effects being constrained to equality across waves.

Tables 4. Forest plots for dataset-specific and meta-analytically aggregated effects are presented in Figure 2. Significant effect sizes ranged from $\beta = -0.03$ to $\beta = -0.14$ across *Loneliness* x *Trait* x *Dataset* combinations.

Consistent with H1.1, a negative and statistically significant cross-lagged effect of changes in extraversion on subsequent changes in loneliness was found across all datasets ($\beta = -0.03$ to -0.11) and in the meta-analytic aggregation ($\beta = -0.04$, $p < .001$). This indicates that, relative to individual's stable levels, within-person increases in extraversion at one time point predict decreases in loneliness at the next with a small effect. In line with H2.1, a significant negative cross-lagged effect of changes in conscientiousness on subsequent changes in loneliness was observed in two datasets ($\beta = -0.08$ to -0.11) and in the meta-analytic aggregation ($\beta = -0.02$, $p = .001$), suggesting that within-person increases in conscientiousness at a given time point predict small subsequent decreases in loneliness. Moreover, consistent with H3.1, a significant negative cross-lagged effect of changes in emotional stability on subsequent changes in loneliness was found in two datasets ($\beta = -0.03$ to -0.14) and in the meta-analytic aggregation ($\beta = -0.03$, $p < .001$). This suggests that, relative to individual's stable levels, within-person increases in emotional stability at one time point predict decreases in loneliness at the next with a small effect. Additionally, a significant negative cross-lagged effect of changes in openness on subsequent changes in loneliness was found in two datasets ($\beta = -0.07$ to -0.12). However, this effect did not reach statistical significance in the meta-analytic aggregation.

Table 4

Standardized Cross-Lagged Effects of the Big Five Personality Traits on Loneliness Across Datasets

	HILDA		HRS-A		HRS-B		LISS		FE	
Effect	β	CI (99%)	β	CI (99%)	β	CI (99%)	β	CI (99%)	β	CI (99%)
Extraversion → Loneliness	**−0.03**	**[−0.05, −0.01]**	**−0.04**	**[−0.07, −0.004]**	**−0.05**	**[−0.10, −0.01]**	**−0.11**	**[−0.21, −0.02]**	**−0.04**	**[−0.06, −0.02]**
Agreeableness → Loneliness	−0.01	[−0.03, 0.01]	0.01	[−0.02, 0.04]	−0.04	[−0.08, 0.01]	−0.05	[−0.13, 0.03]	−0.01	**[−0.03, 0.00]**
Conscientiousness → Loneliness	−0.01	[−0.03, 0.01]	−0.01	[−0.04, 0.02]	**−0.08**	**[−0.13, −0.04]**	**−0.11**	**[−0.18, −0.03]**	−0.02	**[−0.03, −0.004]**
Openness → Loneliness	0.00	[−0.02, 0.02]	0.00	[−0.03, 0.03]	**−0.07**	**[−0.11, −0.02]**	**−0.12**	**[−0.2, −0.05]**	−0.02	**[−0.03, 0.00]**
Emotional Stability → Loneliness	**−0.03**	**[−0.05, −0.01]**	−0.03	[−0.06, 0.00]	−0.03	[−0.07, 0.01]	**−0.14**	**[−0.22, −0.06]**	**−0.03**	**[−0.05, −0.02]**

Note. The table summarizes standardized cross-lagged effects of within-person changes in the Big Five personality traits on changes in loneliness 4 years later in each of the four datasets, along with the fixed-effects meta-analytic estimates in the final column (FE). β = Standardized cross-lagged effect. CI (99%) = 99% Confidence interval. Significant effects (α = .01) are printed in bold.

Figure 2

Forest Plots for Standardized Cross-Lagged Effects of the Big Five Personality Traits on
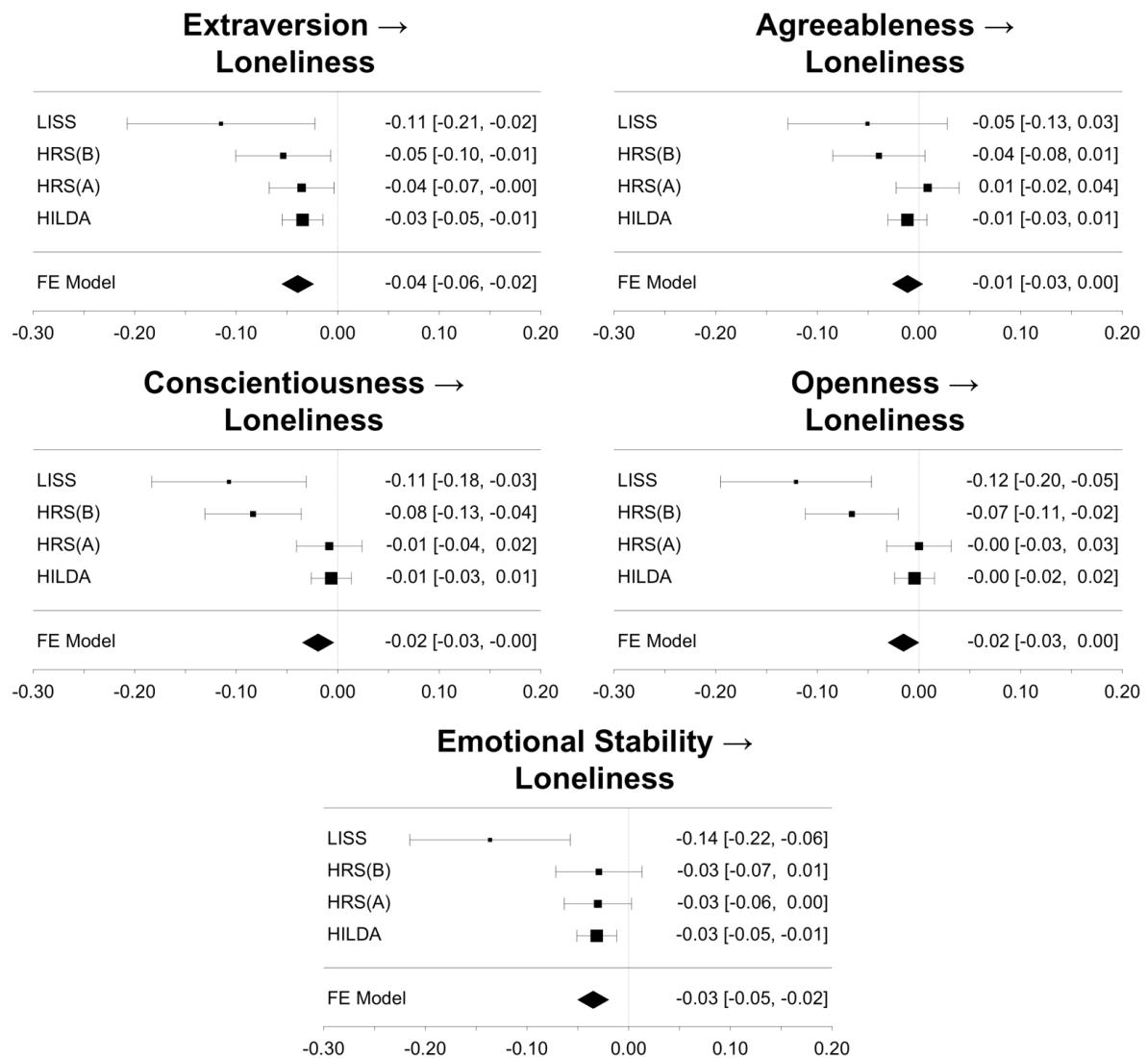
Loneliness

Note. The figure illustrates standardized cross-lagged effects of the Big Five personality traits on changes in loneliness in each of the four datasets and the meta-analytically aggregated estimate. Squares represent point estimates, with their size proportional to the precision of the estimate. Error bars indicate 99% confidence intervals (CI). FE Model = Fixed-effects meta-analytic estimate.

Research Question 2: Do Intraindividual Changes in Loneliness Predict Subsequent Changes in the Big Five Personality Traits?

Standardized cross-lagged effects of changes in loneliness on the development of the Big Five traits in each of the four datasets and the meta-analytic aggregations are presented in Tables 5. Forest plots for dataset-specific and meta-analytically aggregated effects are presented in Figure 3. Standardized cross-lagged effects of changes in loneliness on subsequent changes in the Big Five were generally comparable in their magnitude to those of changes in the Big Five on changes in loneliness. Significant effect sizes ranged from $\beta = -0.02$ to $\beta = -0.12$ across *Loneliness* x *Trait* x *Dataset* combinations.

In line with H1.2, a negative cross-lagged effect of changes in loneliness on subsequent changes in extraversion was observed in three datasets ($\beta = -0.02$ to -0.06) and in the meta-analytic aggregation ($\beta = -0.03$, $p < .001$). This suggests that, relative to individual's stable levels, within-person increases in loneliness at one time point predict small decreases in extraversion at the next. Additionally, consistent with H2.2, a negative standardized cross-lagged effect of changes in loneliness on subsequent changes in conscientiousness was found in two datasets ($\beta = -0.08$ to -0.10) and in the meta-analytic aggregation ($\beta = -0.02$, $p < .001$), suggesting that within-person increases in loneliness at a given time point predict small decreases in conscientiousness at the next. In line with H3.2, a negative cross-lagged effect of changes in loneliness on subsequent changes in emotional stability was observed in one dataset ($\beta = -0.02$, $p = .008$) and in the meta-analytic aggregation ($\beta = -0.02$, $p = .001$). This indicates that, relative to individual's stable levels, within-person increases in loneliness at one time-point predict small decreases in emotional stability at the next.

Moreover, a significant negative cross-lagged effect of changes in loneliness on subsequent changes in agreeableness was found in one dataset ($\beta = -0.08$, $p < .001$) and in

the meta-analytic aggregation ($\beta = -0.02$, $p = .009$), suggesting that within-person increases

in loneliness at a given time point predict small decreases in agreeableness at the next.

Table 5

Standardized Cross-Lagged Effects of Loneliness on the Big Five Personality Traits Across Datasets

	HILDA		HRS-A		HRS-B		LISS		FE	
Effect	β	CI (99%)	β	CI (99%)	β	CI (99%)	β	CI (99%)	β	CI (99%)
Loneliness → Extraversion	**−0.02**	**[−0.04, −0.001]**	**−0.04**	**[−0.08, −0.01]**	**−0.06**	**[−0.11, −0.02]**	−0.06	[−0.15, 0.03]	**−0.03**	**[−0.05, −0.02]**
Loneliness → Agreeableness	0.00	[−0.02, 0.02]	−0.02	[−0.05, 0.01]	**−0.08**	**[−0.12, −0.03]**	−0.04	[−0.11, 0.04]	**−0.02**	**[−0.03, −0.0003]**
Loneliness → Conscientiousness	−0.01	[−0.03, 0.01]	−0.01	[−0.05, 0.02]	**−0.08**	**[−0.13, −0.04]**	**−0.1**	**[−0.17, −0.02]**	**−0.02**	**[−0.04, −0.01]**
Loneliness → Openness	0.02	[0.00, 0.04]	−0.01	[−0.04, 0.02]	**−0.05**	**[−0.1, −0.01]**	**−0.12**	**[−0.19, −0.04]**	0.00	[−0.02, 0.01]
Loneliness → Emotional Stability	**−0.02**	**[−0.04, −0.0004]**	0.01	[−0.03, 0.04]	−0.05	[−0.09, 0.00]	−0.07	[−0.14, 0.00]	**−0.02**	**[−0.03, −0.004]**

Note. The table summarizes standardized cross-lagged effects of within-person changes in loneliness on changes in the Big Five personality traits 4 years later in each of the four datasets, along with the fixed-effects meta-analytic estimates in the final column (FE). β = Standardized cross-lagged effect. CI (99%) = 99% Confidence interval. Significant effects ($\alpha = .01$) are printed in bold.

Figure 3

Forest Plots for Standardized Cross-Lagged Effects of Loneliness on the Big Five Personality
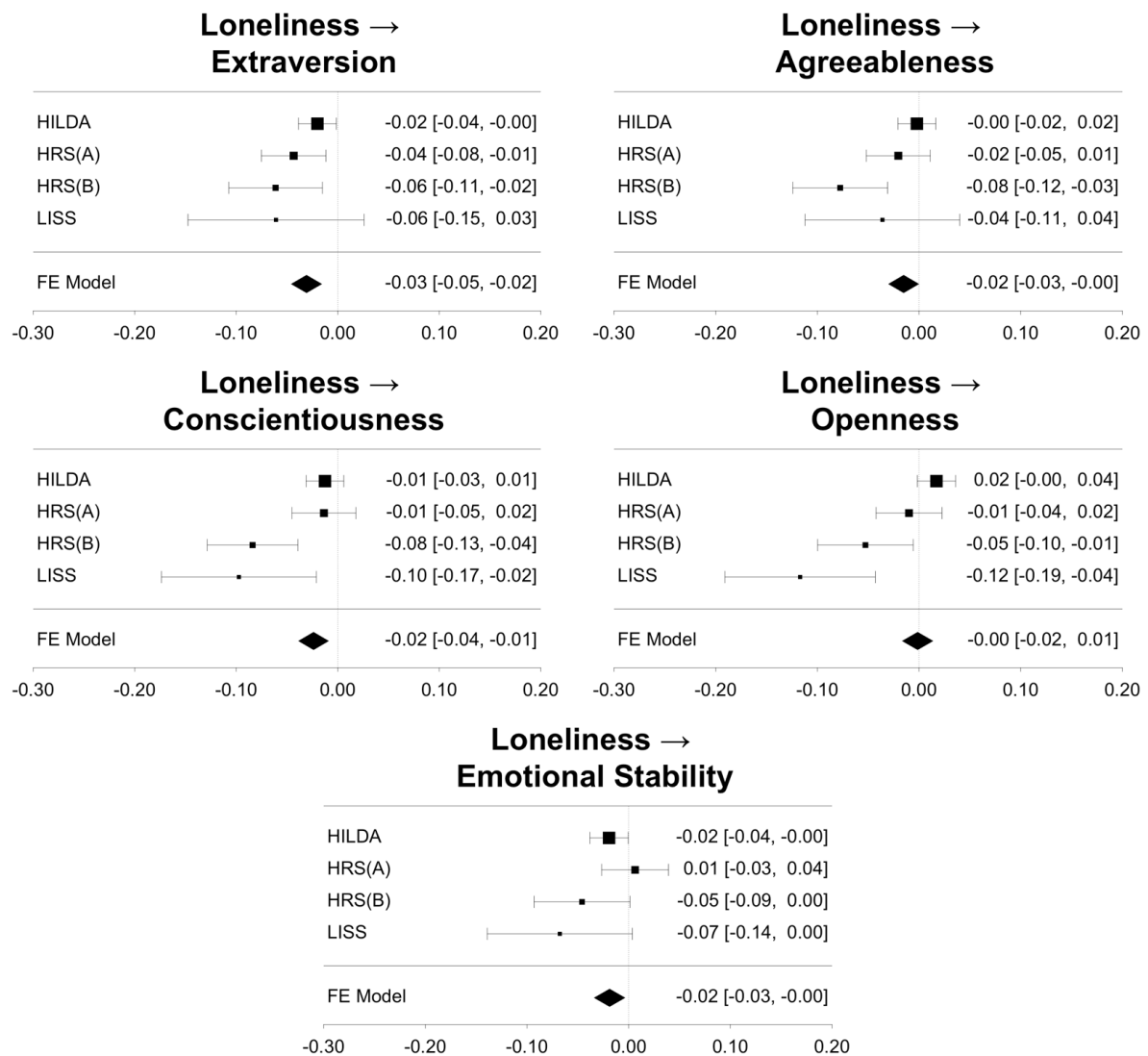
Traits

Note. The figure illustrates standardized cross-lagged effects loneliness on the development of the Big Five personality traits in each of the four datasets and the meta-analytic estimate. Squares represent point estimates, with their size proportional to the precision of the estimate. Error bars indicate 99% confidence intervals (CI). FE Model = Fixed-effects meta-analytic estimate.

Sensitivity Analyses

Given that cross-lagged effects in RI-CLPMs depend on the time interval between waves (e.g., Driver, 2025; Hamaker et al., 2015; Mulder & Hamaker, 2021a), additional RI-CLPMs analyzing waves spaced 1 year apart in LISS and 8 years apart in HILDA and HRS-A were estimated. In doing so, we examined whether the cross-lagged effects varied over varying time intervals between assessments. Standardized cross-lagged effects from these RI-CLPMs are presented in Section 6 of the supplemental materials.

Overall, effect sizes varied considerably within the same dataset across different time intervals and tended to be smaller with shorter and larger with longer intervals. Specifically, in LISS, the cross-lagged effects were smaller over the 1-year interval (mean $\beta = -0.04$) than over the 4-year interval (mean $\beta = -0.09$). Similarly, in HRS-A, the effects were smaller over the 4-year interval (mean $\beta = -0.01$) than over the 8-year interval (mean $\beta = -0.08$). In HILDA, no clear pattern emerged in the size of the cross-lagged effects when comparing the 4-year (mean $\beta = -0.01$) and 8-year intervals (mean $\beta = -0.02$).

Discussion

Understanding reciprocal personality–loneliness transactions is important for both research and practice, for example, to identify individuals at risk of maladaptive developments in these constructs. The present study aimed to identify robust longitudinal transactions between loneliness and the Big Five personality traits by analyzing four datasets from three nationally representative, large-scale panel studies. Meta-analytic aggregation of the findings across the datasets revealed that, at the within-person level, increases in extraversion, conscientiousness, and emotional stability predicted decreases in loneliness 4 years later, and that increases in loneliness predicted decreases in extraversion, agreeableness, conscientiousness, and emotional stability 4 years later. Notably, these cross-lagged effects were small for both directions ($\beta = -0.02$ to -0.04) and effect sizes differed substantially

between *Loneliness* x *Trait* combinations across datasets. Additionally, sensitivity analyses indicated that the time interval between assessments may influence effect magnitude.

Robust Longitudinal Transactions Between Loneliness and the Big Five

The meta-analytic aggregation of standardized cross-lagged effects across the four datasets revealed multiple robust longitudinal transactions between loneliness and the Big Five traits over a 4-year interval. First, in line with H1.1, intraindividual increases in extraversion predicted subsequent decreases in loneliness. This effect stood out as the strongest among all *Loneliness* x *Trait* combinations ($\beta = -0.04$), although small according to current effect size conventions (Orth et al., 2024). One possible explanation for this finding is the relevance of extraversion for both the quantity and quality of social relationships, for example by seeking social interventions (e.g., Deventer et al., 2019; Harris & Vazire, 2016; Solomon & Jackson, 2014).

Second, consistent with H1.2, intraindividual increases in loneliness also predicted subsequent decreases in extraversion. This may appear paradoxical at first sight, as the adaptive role of loneliness would be to motivate reconnection (J. T. Cacioppo et al., 2014; J. T. Cacioppo, Hawkley, et al., 2006). However, research suggests that loneliness contributes to biased social cognitions, negative affect and social withdrawal, which may, in turn, also contribute to decreases in extraversion over time (e.g., J. T. Cacioppo & Hawkley, 2009; Spithoven et al., 2017; Vanhalst et al., 2015).

Third, consistent with H2.1, intraindividual increases in conscientiousness predicted subsequent decreases in loneliness. One explanation for this finding may be that increases in conscientiousness could help people to maintain high-quality social relationships through increased self-control and more reliable and responsible behavior. Such an explanation would be consistent with previous research indicating that higher levels of conscientiousness are associated with more positive social relationships (Anglim et al., 2020), higher relationship

quality (Berry et al., 2000; Dyrenforth et al., 2010; Solomon & Jackson, 2014), more frequent contact with family members (Asendorpf & Wilpers, 1998), and higher levels of perceived social support (Huang et al., 2019).

Fourth, in line with H2.2, intraindividual increases in loneliness also predicted subsequent decreases in conscientiousness. Given that lonely individuals tend to exhibit poorer executive functioning including lower self-regulation (Baumeister et al., 2005; Baumeister & DeWall, 2005; J. T. Cacioppo & Hawkley, 2009), one potential interpretation of this finding is that such impairments might also contribute to decreases in conscientiousness over time.

Fifth, consistent with H3.1, intraindividual increases in emotional stability predicted subsequent decreases in loneliness, which supports prior research emphasizing the role of emotional stability as an important predictor of both the quantity and quality of social relationships (e.g., Denissen & Penke, 2008; Deventer et al., 2019; Harris & Vazire, 2016). Additionally, this findings replicates findings from previous studies that suggested low levels of emotional stability as a potential precursor of later loneliness (e.g., Abdellaoui et al., 2019; Mund & Neyer, 2016; Schunk & Trommsdorff, 2022).

Sixth, in line with H3.2, intraindividual increases in loneliness predicted subsequent decreases in emotional stability. This findings may be of particular importance, as lower emotional stability is associated with various adverse life outcomes, low well-being and health conditions (e.g., Anglim et al., 2020; Widiger & Oltmanns, 2017; Wright & Jackson, 2023). Additionally, it aligns with what has been described as the kindling effect (Monroe & Harkness, 2005; Zeiss & Lewinsohn, 1988), indicating that loneliness leaves enduring scars in an individual's personality traits, which could heighten vulnerability to future loneliness and mental and physical health issues (Mund & Neyer, 2016, 2019). Together, this reinforces

the notion that loneliness can negatively impact various aspects of individuals' lives (e.g., J. T. Cacioppo & Cacioppo, 2014; J. T. Cacioppo & Hawkley, 2009; Holt-Lunstad et al., 2015).

Lastly, we found fairly robust evidence for an additional, unregistered longitudinal effect of loneliness or later agreeableness: Intraindividual increases in loneliness predicted subsequent decreases in agreeableness. This finding may be understood in light of the associations of loneliness with hostility and distrust, and also with maladaptive social cognitions (e.g., J. T. Cacioppo et al., 2014; J. T. Cacioppo & Hawkley, 2009; Langenkamp, 2023), which may, over time, contribute to decreases in agreeableness. However, future research is needed to replicate and examine the potential mechanisms underlying this effect.

It is critical to note that although effect directions were consistent across datasets, the size of the standardized cross-lagged effects differed substantially. Generally, effects were largest in LISS, followed by HRS-B and smallest in HRS-A and HILDA. There are at least three possible explanations for these differences. First, the four datasets differed in their sample characteristics such as nationality, mean age, and gender composition. Although all samples were drawn from Western countries, differences in social norms and expectations may still have contributed to variations in loneliness and its transactions with the Big Five traits (Barreto et al., 2021; Heu, 2025). Second, measurement of loneliness varied across the four datasets. In HILDA, loneliness was measured using a single direct item explicitly asking about loneliness. In contrast, in HRS and LISS, it was assessed with multiple items, without any direct reference to loneliness. Research indicates that the prevalence of loneliness and its associations with the Big Five depend on the way loneliness is assessed (Buecker et al., 2020; Mund et al., 2023, 2023; Russell, 1996). Thus, it is possible that the transactions between loneliness and the Big Five traits observed in the present research may also have been influenced by variations in the measurement of loneliness across the four datasets. Third, and relatedly, HILDA, HRS, and LISS differed in their measurement of the Big Five personality

traits, including differences in the number of items and the content used to assess each trait. For example, in contrast to the other datasets, emotional stability in HILDA was assessed with a stronger emphasis on social relationships using participant ratings of adjectives such as "envious", "fretful", or "jealous". Thus, the measurement characteristics of the Big Five traits may have shaped how closely aligned some traits were with aspects of social relationships and loneliness.

In summary, although effect sizes differed across individual datasets, the present study identified robust longitudinal transactions between loneliness and the Big Five traits of extraversion, conscientiousness, and emotional stability over a 4-year interval, contributing to a better understanding of the relationship between loneliness and personality traits over time.

Theoretical and Practical Implications

The findings of the present study have several theoretical and practical implications. In line with prior longitudinal research (Abdellaoui et al., 2019; Joshanloo, 2024; Mund & Neyer, 2016; Schunk & Trommsdorff, 2022), they point to reciprocal effects between loneliness and personality traits over multiple years and indicate that personality traits not only contribute to but also respond to changes in loneliness. As such, they suggest treating loneliness not only as an outcome, as in the majority of existing research (e.g., Tapia-Munoz et al., 2024; von Soest et al., 2020; Wieczorek et al., 2021), but also as a potential antecedent to personality development in both theory and future research.

Relative to the effects reported in previous longitudinal studies that have investigated personality-loneliness transactions (Joshanloo, 2024; Schunk & Trommsdorff, 2022) and according to current effect size conventions (Orth et al., 2024), the meta-analytically aggregated cross-lagged effects in the present study were small. Nevertheless, even small effects can be of practical relevance when they accumulate over time (Funder & Ozer, 2019; Götz et al., 2022). In particular, individuals low in extraversion, emotional stability, and

conscientiousness may be at risk for a vicious cycle in which experiences of loneliness contribute to maladaptive changes in these traits, which in turn increase the risk of further increases in loneliness. Low levels of extraversion, emotional stability, and conscientiousness may thus be used as indicators to identify individuals at risk for an unfavorable loneliness trajectory early on.

Importantly, as cross-lagged effects are sensitive to the time interval between assessments (e.g., Driver, 2025; Hamaker et al., 2015; Mulder & Hamaker, 2021a), the longitudinal transactions between loneliness and personality traits observed in the present study are specific to a 4-year interval. Thus, the current findings leave it unclear how these transactions unfold across time and at which intervals they peak. Sensitivity analyses suggest that the transactions between loneliness and personality traits become more pronounced with increasing time intervals.[5] One potential explanation for this is that the effects of changes in personality traits on changes in loneliness, and vice versa, may take several years to become practically relevant. For example, getting more conscientious could, over the course of months or years, enhance the quality of social relationships through greater self-control and dependability and may ultimately reduce loneliness. In contrast, particularly prolonged feelings of loneliness over extended periods of time could foster negative social cognitions, behavioral confirmation processes, and unsatisfying social interactions (J. T. Cacioppo & Hawkley, 2009), which may slowly alter individuals' dispositional patterns of thoughts, feelings and behaviors. While the present study identified robust transactions between loneliness and the Big Five traits over 4 years, further research is needed to examine the underlying mechanisms and determine the optimal time lag for capturing loneliness-

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[5] Importantly, this pattern may partly reflect differences in the precision of the cross-lagged effect estimates and in the statistical power to detect them, as more measurement waves were available in LISS when longer time intervals were examined, but fewer in HILDA and HRS-A.

personality transactions (e.g., Driver & Voelkle, 2018; Hecht & and Zitzmann, 2021; Voelkle et al., 2012).

Limitations and Future Directions

The present study represents the most comprehensive investigation of the longitudinal transactions between loneliness and the Big Five personality traits to date. Nonetheless, it has several limitations that should be addressed in future research.

First, all included panel studies were conducted in Western, democratic countries. Thus, the findings of the present study may not be directly applicable to other cultural contexts (Henrich et al., 2010; Thalmayer et al., 2021). For example, associations between loneliness and personality traits were found to vary across cultures (Freilich et al., 2023). Additionally, individual differences in personality traits may be better captured with other taxonomies than the Big Five in other cultures (Laajaj et al., 2019; Thalmayer et al., 2022, 2025). Future research on the relationship between loneliness and personality traits should address these limitations by including more diverse samples from multicultural settings. This is particularly important for designing interventions to prevent and reduce loneliness and foster adaptive personality development that can be applied across cultural groups.

A second limitation is the reliance on self-report measures, which can be biased due to measurement artifacts such as social desirability, response styles, or reference group effects (Bleidorn, 2024; Lenhausen et al., 2023; Paulhus, 2017; Paulhus & Vazire, 2007). Using informant-reports for both loneliness and personality traits would help to evaluate the generalizability of the present findings beyond self-reports. Additionally, longer loneliness and personality trait inventories would allow for the assessment of facets of loneliness and personality traits, enabling a more fine-grained examination of their transactions (e.g., Mõttus, 2016; Mõttus & Rozgonjuk, 2021). For example, emerging evidence suggests that

personality-loneliness transactions differ between social or emotional facets of loneliness (Buecker et al., 2020).

Third, the number of waves included in the RI-CLPMs and the choice of a consistent 4-year interval between assessment waves were constrained by the structure of the four datasets rather than theoretical considerations. Future research should systematically vary the time interval between assessments to identify how the transactions between personality traits and loneliness vary over time. Initial evidence, for example, suggests that personality traits are also associated with intraindividual fluctuations in loneliness over relatively short time intervals between assessments such as days or weeks (Shrestha et al., 2025).

A fourth limitation concerns the use of fixed-effects meta-analysis for aggregating the standardized cross-lagged effects across datasets. This approach was chosen given that only four datasets met the inclusion criteria for our analyses. However, fixed-effects meta-analysis assumes that all datasets share a common true effect size, which may be wrong given the variations in sample and study characteristics between the four datasets (Borenstein et al., 2010; Dettori et al., 2022). Thus, the meta-analytically aggregated effects must be interpreted with caution and may not generalize beyond the populations included in the present analysis. Future research aiming to investigate the longitudinal transactions between loneliness and the Big Five traits should aim to aggregate findings from more datasets, to enable the reliable performance of random-effects meta-analysis. Moreover, this would enable the examination of study-level moderators and could help to better explain the sources of variation in effect sizes across individual datasets.

Conclusion

The present study revealed multiple robust longitudinal transactions between loneliness and the Big Five personality over a 4-year interval. Specifically, at the within-person level, increases in extraversion, conscientiousness, and emotional stability predicted

subsequent decreases in loneliness, and increases in loneliness predicted subsequent

decreases in extraversion, agreeableness, conscientiousness, and emotional stability. This

pattern suggests that personality traits both contribute and respond to changes in loneliness,

and that targeting them may help prevent and reduce loneliness. For example, interventions

aimed at reducing loneliness may benefit from taking personality traits such extraversion,

conscientiousness, and emotional stability into account when designing tailored approaches.

At the same time, further research is needed to clarify the mechanisms underlying

personality-loneliness transactions and identify the time interval at which these reciprocal

processes are most pronounced.

Acknowledgements

Statements and Declarations

Ethical considerations

The present research was exempt from ethical review at the University of Zurich as it relied exclusively on anonymized, secondary data.

Consent to participate

Not applicable.

Consent for publication

Not applicable.

Declaration of conflicting interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding statement

The authors received no financial support for the research, authorship, and/or publication of this article.

Open Science Statement

The present study was preregistered on March 14, 2025, at

https://osf.io/t3f25/?view_only=b7a8160dbda04784bb282e3e4942f6b4. A codebook, analysis scripts, and supplemental materials can be retrieved from

https://osf.io/mx2cp/?view_only=e277e5a6609443f09f913129a70d3e2f. Data included in the present study could not be uploaded to OSF due to legal constraints. However, researcher can request access to the datasets after signing user contracts with the respective panel providers (see details provided in the Methods section).

References

Abdellaoui, A., Chen, H.-Y., Willemsen, G., Ehli, E. A., Davies, G. E., Verweij, K. J. H., Nivard, M. G., de Geus, E. J. C., Boomsma, D. I., & Cacioppo, J. T. (2019). Associations between loneliness and personality are mostly driven by a genetic association with Neuroticism. *Journal of Personality*, *87*(2), 386–397. https://doi.org/10.1111/jopy.12397

Allport, G. W. (1961). *Pattern and growth in personality*. Holt, Reinhart & Winston.

Alt, P., Reim, J., & Walper, S. (2021). Fall from grace: Increased loneliness and depressiveness among extraverted youth during the German COVID-19 lockdown. *Journal of Research on Adolescence*, *31*(3), 678–691. https://doi.org/10.1111/jora.12648

Anderson, C., John, O. P., Keltner, D., & Kring, A. M. (2001). Who attains social status? Effects of personality and physical attractiveness in social groups. *Journal of Personality and Social Psychology*, *81*(1), 116–132. https://doi.org/10.1037/0022-3514.81.1.116

Anglim, J., Horwood, S., Smillie, L. D., Marrero, R. J., & Wood, J. K. (2020). Predicting psychological and subjective well-being from personality: A meta-analysis. *Psychological Bulletin*, *146*(4), 279–323. https://doi.org/10.1037/bul0000226

Asendorpf, J. B., & Wilpers, S. (1998). Personality effects on social relationships. *Journal of Personality and Social Psychology*, *74*(6), 1531–1544. https://doi.org/10.1037/0022-3514.74.6.1531

Back, M. D., Branje, S., Eastwick, P. W., Human, L. J., Penke, L., Sadikaj, G., Slatcher, R. B., Thielmann, I., van Zalk, M. H. W., & Wrzus, C. (2023). Personality and social relationships: What do we know and where do we go. *Personality Science*, *4*(1), e7505. https://doi.org/10.5964/ps.7505

Back, M. D., Schmukle, S. C., & Egloff, B. (2011). A closer look at first sight: Social

relations lens model analysis of personality and interpersonal attraction at zero

acquaintance. *European Journal of Personality*, *25*(3), 225–238.

https://doi.org/10.1002/per.790

Barańczuk, U. (2019). The five factor model of personality and emotion regulation: A meta-

analysis. *Personality and Individual Differences*, *139*, 217–227.

https://doi.org/10.1016/j.paid.2018.11.025

Barjaková, M., Garnero, A., & d'Hombres, B. (2023). Risk factors for loneliness: A literature

review. *Social Science & Medicine*, *334*, 116163.

https://doi.org/10.1016/j.socscimed.2023.116163

Barreto, M., Victor, C., Hammond, C., Eccles, A., Richins, M. T., & Qualter, P. (2021).

Loneliness around the world: Age, gender, and cultural differences in loneliness.

Personality and Individual Differences, *169*, 110066.

https://doi.org/10.1016/j.paid.2020.110066

Baumeister, R. F., & DeWall, C. N. (2005). The inner dimension of social exclusion:

Intelligent thought and self-regulation among rejected persons. In *The Social Outcast*.

Psychology Press.

Baumeister, R. F., DeWall, C. N., Ciarocco, N. J., & Twenge, J. M. (2005). Social exclusion

impairs self-regulation. *Journal of Personality and Social Psychology*, *88*(4), 589–

604. https://doi.org/10.1037/0022-3514.88.4.589

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal

attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–

529. https://doi.org/10.1037/0033-2909.117.3.497

Berry, D. S., Willingham, J. K., & Thayer, C. A. (2000). Affect and personality as predictors of conflict and closeness in young adults' friendships. *Journal of Research in Personality*, *34*(1), 84–107. https://doi.org/10.1006/jrpe.1999.2271

Bleidorn, W. (2024). Toward a theory of lifespan personality trait development. *Annual Review of Developmental Psychology*, *6*, 455–478. https://doi.org/10.1146/annurev-devpsych-010923-101709

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2010). A basic introduction to fixed-effect and random-effects models for meta-analysis. *Research Synthesis Methods*, *1*(2), 97–111. https://doi.org/10.1002/jrsm.12

Bowlby, J. (1969). *Attachment and loss: Attachment* (Vol. 1). Hogarth.

Buecker, S., Maes, M., Denissen, J. J. A., & Luhmann, M. (2020). Loneliness and the Big Five personality traits: A meta–analysis. *European Journal of Personality*, *34*(1), 8–28. https://doi.org/10.1002/per.2229

Butkovic, A., Brkovic, I., & Bratko, D. (2012). Predicting well-being from personality in adolescents and older adults. *Journal of Happiness Studies*, *13*(3), 455–467. https://doi.org/10.1007/s10902-011-9273-7

Cacioppo, J. T., & Cacioppo, S. (2014). Social relationships and health: The toxic effects of perceived social isolation. *Social and Personality Psychology Compass*, *8*(2), 58–72. https://doi.org/10.1111/spc3.12087

Cacioppo, J. T., Cacioppo, S., & Boomsma, D. I. (2014). Evolutionary mechanisms for loneliness. *Cognition & Emotion*, *28*(1), 3–21. https://doi.org/10.1080/02699931.2013.837379

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.

https://doi.org/10.1177/1745691614564876

Cacioppo, J. T., Fowler, J. H., & Christakis, N. A. (2009). Alone in the crowd: The structure

and spread of loneliness in a large social network. *Journal of Personality and Social*

Psychology, *97*(6), 977–991. https://doi.org/10.1037/a0016076

Cacioppo, J. T., & Hawkley, L. C. (2009). Perceived social isolation and cognition. *Trends in*

Cognitive Sciences, *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., 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.

https://doi.org/10.1016/j.jrp.2005.11.007

Cacioppo, J. T., Hawkley, L. C., & Thisted, R. A. (2010). Perceived social isolation makes

me sad: 5-year cross-lagged analyses of loneliness and depressive symptomatology in

the Chicago Health, Aging, and Social Relations Study. *Psychology and Aging*, *25*(2),

453–463. https://doi.org/10.1037/a0017216

Cacioppo, J. T., Hughes, M. E., Waite, L. J., Hawkley, L. C., & Thisted, R. A. (2006).

Loneliness as a specific risk factor for depressive symptoms: Cross-sectional and

longitudinal analyses. *Psychology and Aging*, *21*(1), 140–151.

https://doi.org/10.1037/0882-7974.21.1.140

Cacioppo, S., Grippo, A. J., London, S., Goossens, L., & Cacioppo, J. T. (2015). Loneliness:

Clinical import and interventions. *Perspectives on Psychological Science : A Journal*

of the Association for Psychological Science, *10*(2), 238–249.

https://doi.org/10.1177/1745691615570616

Campbell, W. K., Krusemark, E. A., Dyckman, K. A., Brunell, A. B., McDowell, J. E.,

Twenge, J. M., & Clementz, B. A. (2006). A magnetoencephalography investigation

of neural correlates for social exclusion and self-control. *Social Neuroscience*, *1*(2), 124–134. https://doi.org/10.1080/17470910601035160

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. https://doi.org/10.1001/archpedi.160.8.805

Costa, P. T., & McCrae, R. R. (1992). *Revised NEO personality inventory (NEO-PI-R) and NEO five-factor inventory (NEO-FFI) professional manual*. Psychological Assessment Resources.

Cuperman, R., & Ickes, W. (2009). Big Five predictors of behavior and perceptions in initial dyadic interactions: Personality similarity helps extraverts and introverts, but hurts "disagreeables". *Journal of Personality and Social Psychology*, *97*(4), 667–684. https://doi.org/10.1037/a0015741

De Jong Gierveld, J., & Van Tilburg, T. (2006). A 6-item scale for overall, emotional, and social loneliness: Confirmatory tests on survey data. *Research on Aging*, *28*(5), 582–598. https://doi.org/10.1177/0164027506289723

de Jong Gierveld, J., & van Tilburg, T. (2010). The De Jong Gierveld Short Scales for Emotional and Social Loneliness: Tested on data from 7 countries in the UN generations and gender surveys. *European Journal of Ageing*, *7*(2), 121–130. https://doi.org/10.1007/s10433-010-0144-6

De Jong-Gierveld, J. (1987). Developing and testing a model of loneliness. *Journal of Personality and Social Psychology*, *53*(1), 119–128. https://doi.org/10.1037//0022-3514.53.1.119

De Jong-Gierveld, J. (1989). Personal relationships, social support, and loneliness. *Journal of Social and Personal Relationships*, *6*(2), 197–221. https://doi.org/10.1177/026540758900600204

Demir, M., & Weitekamp, L. A. (2007). I am so happy 'cause today I found my friend: Friendship and personality as predictors of happiness. *Journal of Happiness Studies*, *8*(2), 181–211. https://doi.org/10.1007/s10902-006-9012-7

Denissen, J. J. A., & Penke, L. (2008). Neuroticism predicts reactions to cues of social inclusion. *European Journal of Personality*, *22*(6), 497–517. https://doi.org/10.1002/per.682

Dettori, J. R., Norvell, D. C., & Chapman, J. R. (2022). Fixed-effect vs random-effects models for meta-analysis: 3 points to consider. *Global Spine Journal*, *12*(7), 1624–1626. https://doi.org/10.1177/21925682221110527

Deventer, J., Wagner, J., Lüdtke, O., & Trautwein, U. (2019). Are personality traits and relationship characteristics reciprocally related? Longitudinal analyses of codevelopment in the transition out of high school and beyond. *Journal of Personality and Social Psychology*, *116*(2), 331–347. https://doi.org/10.1037/pspp0000191

Driver, C. C. (2025). Inference with cross-lagged effects—Problems in time. *Psychological Methods*, *30*(1), 174–202. https://doi.org/10.1037/met0000665

Driver, C. C., & Voelkle, M. C. (2018). Hierarchical Bayesian continuous time dynamic modeling. *Psychological Methods*, *23*(4), 774–799. https://doi.org/10.1037/met0000168

Dyrenforth, P. S., Kashy, D. A., Donnellan, M. B., & Lucas, R. E. (2010). Predicting relationship and life satisfaction from personality in nationally representative samples from three countries: The relative importance of actor, partner, and similarity effects. *Journal of Personality and Social Psychology*, *99*(4), 690–702. https://doi.org/10.1037/a0020385

Evans, A. M., & Revelle, W. (2008). Survey and behavioral measurements of interpersonal trust. *Journal of Research in Personality*, *42*(6), 1585–1593. https://doi.org/10.1016/j.jrp.2008.07.011

Festa, C. C., Barry, C. M., Sherman, M. F., & Grover, R. L. (2012). Quality of college students' same-sex friendships as a function of personality and interpersonal competence. *Psychological Reports*, *110*(1), 283–296. https://doi.org/10.2466/04.09.10.21.PR0.110.1.283-296

Freilich, C. D., Mann, F. D., & Krueger, R. F. (2023). Comparing associations between personality and loneliness at midlife across three cultural groups. *Journal of Personality*, *91*(3), 653–666. https://doi.org/10.1111/jopy.12765

Funder, D. C., & Ozer, D. J. (2019). Evaluating effect size in psychological research: Sense and nonsense. *Advances in Methods and Practices in Psychological Science*, *2*(2), 156–168. https://doi.org/10.1177/2515245919847202

Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological Assessment*, *4*(1), 26–42. https://doi.org/10.1037/1040-3590.4.1.26

Götz, F. M., Gosling, S. D., & Rentfrow, P. J. (2022). Small effects: The indispensable foundation for a cumulative psychological science. *Perspectives on Psychological Science*, *17*(1), 205–215. https://doi.org/10.1177/1745691620984483

Hamaker, E. L., Kuiper, R. M., & Grasman, R. P. P. P. (2015). A critique of the cross-lagged panel model. *Psychological Methods*, *20*(1), 102–116. https://doi.org/10.1037/a0038889

Harris, K., & Vazire, S. (2016). On friendship development and the Big Five personality traits. *Social and Personality Psychology Compass*, *10*(11), 647–667. https://doi.org/10.1111/spc3.12287

Hawkley, L. C. (2022). Loneliness and health. *Nature Reviews Disease Primers*, *8*(1), 1–2. https://doi.org/10.1038/s41572-022-00355-9

Hawkley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine : A Publication of the Society of Behavioral Medicine*, *40*(2), 10.1007/s12160-010-9210– 9218. https://doi.org/10.1007/s12160-010-9210-8

Hawkley, L. C., & Capitanio, J. P. (2015). Perceived social isolation, evolutionary fitness and health outcomes: A lifespan approach. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, *370*(1669), 20140114. https://doi.org/10.1098/rstb.2014.0114

Hawkley, L. C., Masi, C. M., Berry, J. D., & Cacioppo, J. T. (2006). Loneliness is a unique predictor of age-related differences in systolic blood pressure. *Psychology and Aging*, *21*(1), 152–164. https://doi.org/10.1037/0882-7974.21.1.152

Hawkley, L. C., Thisted, R. A., Masi, C. M., & Cacioppo, J. T. (2010). Loneliness predicts increased blood pressure: 5-year cross-lagged analyses in middle-aged and older adults. *Psychology and Aging*, *25*(1), 132–141. https://doi.org/10.1037/a0017805

Hecht, M., & and Zitzmann, S. (2021). Exploring the unfolding of dynamic effects with continuous-time models: Recommendations concerning statistical power to detect peak cross-lagged effects. *Structural Equation Modeling: A Multidisciplinary Journal*, *28*(6), 894–902. https://doi.org/10.1080/10705511.2021.1914627

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *The Behavioral and Brain Sciences*, *33*(2–3), 61–135. https://doi.org/10.1017/S0140525X0999152X

Heu, L. C. (2025). The loneliness of the odd one out: How deviations from social norms can help explain loneliness across cultures. *Perspectives on Psychological Science: A*

Journal of the Association for Psychological Science, *20*(2), 199–218.

https://doi.org/10.1177/17456916231192485

Hisler, G. C., Krizan, Z., DeHart, T., & Wright, A. G. C. (2020). Neuroticism as the intensity, reactivity, and variability in day-to-day affect. *Journal of Research in Personality*, *87*, 103964. https://doi.org/10.1016/j.jrp.2020.103964

Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: A meta-analytic review. *Perspectives on Psychological Science: A Journal of the Association for Psychological Science*, *10*(2), 227–237. https://doi.org/10.1177/1745691614568352

Huang, J., Wang, X., Li, W., & An, Y. (2019). The relationship between conscientiousness and posttraumatic stress disorder among young Chinese firefighters: The mediating effect of perceived social support. *Psychiatry Research*, *273*, 450–455. https://doi.org/10.1016/j.psychres.2019.01.053

Joint Research Centre. (2022). *Loneliness prevalence in the EU*. The Joint Research Centre: EU Science Hub, European Commission. https://joint-research-centre.ec.europa.eu/scientific-activities-z/survey-methods-and-analysis-centre-smac/loneliness/loneliness-prevalence-eu_en

Joshanloo, M. (2024). Within-person associations between personality traits and loneliness controlling for negative affect. *Personality and Individual Differences*, *223*, 112609. https://doi.org/10.1016/j.paid.2024.112609

Juster, F. T., & Suzman, R. (1995). An overview of the Health and Retirement Study. *The Journal of Human Resources*, *30*, 7–56. https://doi.org/10.2307/146277

Kang, W. (2023). Establishing the associations between the Big Five personality traits and self-reported number of close friends: A cross-sectional and longitudinal study. *Acta Psychologica*, *239*, 104010. https://doi.org/10.1016/j.actpsy.2023.104010

Kendler, K. S. (1993). A longitudinal twin study of personality and major depression in

women. *Archives of General Psychiatry*, *50*(11), 853–862.

https://doi.org/10.1001/archpsyc.1993.01820230023002

Klein, D. N., Durbin, E. C., Shankman, S. A., & Santiago, N. J. (2002). Depression and

personality. In I. H. Gotlib & C. L. Hammen, *Handbook of depression* (pp. 115–140).

Guilford Press.

Laajaj, R., Macours, K., Pinzon Hernandez, D. A., Arias, O., Gosling, S. D., Potter, J., Rubio-

Codina, M., & Vakis, R. (2019). Challenges to capture the big five personality traits in

non-WEIRD populations. *Science Advances*, *5*(7), eaaw5226.

https://doi.org/10.1126/sciadv.aaw5226

Lachman, M. E., & Weaver, S. L. (1997). *The Midlife Development Inventory (MIDI)*

Personality Scales: Scale construction and scoring. Brandeis University.

Langenkamp, A. (2023). The influence of loneliness on perceived connectedness and trust

beliefs – Longitudinal evidence from the Netherlands. *Journal of Social and Personal*

Relationships, *40*(7), 2298–2322. https://doi.org/10.1177/02654075221144716

Lara, E., Caballero, F. F., Rico-Uribe, L. A., Olaya, B., Haro, J. M., Ayuso-Mateos, J. L., &

Miret, M. (2019). Are loneliness and social isolation associated with cognitive

decline? *International Journal of Geriatric Psychiatry*, *34*(11), 1613–1622.

https://doi.org/10.1002/gps.5174

Lenhausen, M. R., Hopwood, C. J., & Bleidorn, W. (2023). Nature and impact of reference

group effects in personality assessment data. *Journal of Personality Assessment*,

105(5), 581–589. https://doi.org/10.1080/00223891.2022.2132504

Luhmann, M., & Hawkley, L. C. (2016). Age differences in loneliness from late adolescence

to oldest old age. *Developmental Psychology*, *52*(6), 943–959.

https://doi.org/10.1037/dev0000117

Mader, N., Arslan, R. C., Schmukle, S. C., & Rohrer, J. M. (2023). Emotional (in)stability:

    Neuroticism is associated with increased variability in negative emotion after all.

    Proceedings of the National Academy of Sciences, *120*(23), e2212154120.

    https://doi.org/10.1073/pnas.2212154120

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. *Developmental Psychology*, *55*(7), 1548–1565.

    https://doi.org/10.1037/dev0000719

Making Caring Common. (2024). *Loneliness in America: Just the tip of the iceberg?* Making

    Caring Common Project, Harvard Graduate School of Education.

    https://mcc.gse.harvard.edu/reports/loneliness-in-america-2024

Mansour, K. A., Greenwood, C. J., Biden, E. J., Francis, L. M., Olsson, C. A., & Macdonald,

    J. A. (2021). Pre-pandemic predictors of loneliness in adult men during COVID-19.

    Frontiers in Psychiatry, *12*. https://doi.org/10.3389/fpsyt.2021.775588

McCrae, R. R. (1996). Social consequences of experiential openness. *Psychological Bulletin*,

    120(3), 323–337. https://doi.org/10.1037/0033-2909.120.3.323

Mereish, E. H., Katz-Wise, S. L., & Woulfe, J. (2017). Bisexual-specific minority stressors,

    psychological distress, and suicidality in bisexual individuals: The mediating role of

    loneliness. *Prevention Science: The Official Journal of the Society for Prevention

    Research*, *18*(6), 716–725. https://doi.org/10.1007/s11121-017-0804-2

Monroe, S. M., & Harkness, K. L. (2005). Life stress, the "kindling" hypothesis, and the

    recurrence of depression: Considerations from a life stress perspective. *Psychological

    Review*, *112*(2), 417–445. https://doi.org/10.1037/0033-295X.112.2.417

Mõttus, R. (2016). Towards more rigorous personality trait–outcome research. *European Journal of Personality*, *30*(4), 292–303. https://doi.org/10.1002/per.2041

Mõttus, R., & Rozgonjuk, D. (2021). Development is in the details: Age differences in the Big Five domains, facets, and nuances. *Journal of Personality and Social Psychology*, *120*(4), 1035–1048. https://doi.org/10.1037/pspp0000276

Mulder, J. D. (2023). Power analysis for the random intercept cross-lagged panel model using the powRICLPM R-package. *Structural Equation Modeling: A Multidisciplinary Journal*, *30*(4), 645–658. https://doi.org/10.1080/10705511.2022.2122467

Mulder, J. D., & Hamaker, E. L. (2021a). Three extensions of the random intercept cross-lagged panel model. *Structural Equation Modeling: A Multidisciplinary Journal*, *28*(4), 638–648. https://doi.org/10.1080/10705511.2020.1784738

Mulder, J. D., & Hamaker, E. L. (2021b). *Using lavaan*. The RI-CLPM & Extensions. https://jeroendmulder.github.io/RI-CLPM/lavaan.html

Mund, M., Maes, M., Drewke, P. M., Gutzeit, A., Jaki, I., & Qualter, P. (2023). Would the real loneliness please stand up? The validity of loneliness scores and the reliability of single-item scores. *Assessment*, *30*(4), 1226–1248. https://doi.org/10.1177/10731911221077227

Mund, M., & Neyer, F. J. (2014). Treating personality-relationship transactions with respect: Narrow facets, advanced models, and extended time frames. *Journal of Personality and Social Psychology*, *107*(2), 352–368. https://doi.org/10.1037/a0036719

Mund, M., & Neyer, F. J. (2016). The winding paths of the lonesome cowboy: Evidence for mutual influences between personality, subjective health, and loneliness. *Journal of Personality*, *84*(5), 646–657. https://doi.org/10.1111/jopy.12188

Mund, M., & Neyer, F. J. (2019). Loneliness effects on personality. *International Journal of Behavioral Development*, *43*(2), 136–146. https://doi.org/10.1177/0165025418800224

Neyer, F. J., & Lehnart, J. (2007). Relationships matter in personality development: Evidence from an 8-year longitudinal study across young adulthood. *Journal of Personality*, *75*(3), 535–568. https://doi.org/10.1111/j.1467-6494.2007.00448.x

Ormel, J., Oldehinkel, A. J., & Brilman, E. I. (2001). The interplay and etiological continuity of neuroticism, difficulties, and life events in the etiology of major and subsyndromal, first and recurrent depressive episodes in later life. *The American Journal of Psychiatry*, *158*(6), 885–891. https://doi.org/10.1176/appi.ajp.158.6.885

Ormstad, H., Eilertsen, G., Heir, T., & Sandvik, L. (2020). Personality traits and the risk of becoming lonely in old age: A 5-year follow-up study. *Health and Quality of Life Outcomes*, *18*(1), 47. https://doi.org/10.1186/s12955-020-01303-5

Orth, U. (2013). How large are actor and partner effects of personality on relationship satisfaction? The importance of controlling for shared method variance. *Personality and Social Psychology Bulletin*, *39*(10), 1359–1372. https://doi.org/10.1177/0146167213492429

Orth, U., Clark, D. A., Donnellan, M. B., & Robins, R. W. (2021). Testing prospective effects in longitudinal research: Comparing seven competing cross-lagged models. *Journal of Personality and Social Psychology*, *120*(4), 1013–1034. https://doi.org/10.1037/pspp0000358

Orth, U., Meier, L. L., Bühler, J. L., Dapp, L. C., Krauss, S., Messerli, D., & Robins, R. W. (2024). Effect size guidelines for cross-lagged effects. *Psychological Methods*, *29*(2), 421–433. https://doi.org/10.1037/met0000499

Park, C., Majeed, A., Gill, H., Tamura, J., Ho, R. C., Mansur, R. B., Nasri, F., Lee, Y., Rosenblat, J. D., Wong, E., & McIntyre, R. S. (2020). The effect of loneliness on distinct health outcomes: A comprehensive review and meta-analysis. *Psychiatry Research*, *294*, 113514. https://doi.org/10.1016/j.psychres.2020.113514

Paulhus, D. L. (2017). Socially desirable responding on self-reports. In V. Zeigler-Hill & T. K. Shackelford (Eds.), *Encyclopedia of Personality and Individual Differences* (pp. 1–5). Springer International Publishing. https://doi.org/10.1007/978-3-319-28099-8_1349-1

Paulhus, D. L., & Vazire, S. (2007). The self-report method. In *Handbook of research methods in personality psychology* (pp. 224–239). The Guilford Press.

Peplau, L. A., & Perlman, D. (1982). Perspectives on loneliness. In L. A. Peplau & D. Perlman, *Loneliness: A sourcebook of current theory, research and therapy* (pp. 1–18). John Wiley & Sons.

Pressman, S. D., Cohen, S., Miller, G. E., Barkin, A., Rabin, B. S., & Treanor, J. J. (2005). Loneliness, social network size, and immune response to influenza vaccination in college freshmen. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, *24*(3), 297–306. https://doi.org/10.1037/0278-6133.24.3.297

R Core Team. (2024). *R: A language and environment for statistical computing* (Version 4.4.1) [Computer software]. R Foundation for Statistical Computing. https://www.r-project.org/

Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software*, *48*, 1–36. https://doi.org/10.18637/jss.v048.i02

Russell, D. W. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment*, *66*(1), 20–40. https://doi.org/10.1207/s15327752jpa6601_2

Saucier, G. (1994). Mini-Markers: A brief version of Goldberg's unipolar Big-Five markers. *Journal of Personality Assessment*, *63*(3), 506–516. https://doi.org/10.1207/s15327752jpa6303_8

Scherpenzeel, A., & Das, J. W. M. (2010). "True" longitudinal and probability-based internet panels: Evidence from the Netherlands. In J. W. M. Das, P. Ester, & L. Kaczmirek (Eds.), *Social and Behavioral Research and the Internet* (pp. 77–103). Taylor & Francis.

Schunk, F., & Trommsdorff, G. (2022). Longitudinal associations of neuroticism with life satisfaction and social adaptation in a nationally representative adult sample. *Journal of Personality*, 1–15. https://doi.org/10.1111/jopy.12783

Selfhout, M., Burk, W., Branje, S., Denissen, J., van Aken, M., & Meeus, W. (2010). Emerging late adolescent friendship networks and Big Five personality traits: A social network approach. *Journal of Personality*, *78*(2), 509–538. https://doi.org/10.1111/j.1467-6494.2010.00625.x

Shrestha, S., Sigdel, K., Pokharel, M., & Columbus, S. (2025). Big Five traits predict between- and within-person variation in loneliness. *European Journal of Personality*, *39*(1), 90–104. https://doi.org/10.1177/08902070241239834

Solomon, B. C., & Jackson, J. J. (2014). Why do personality traits predict divorce? Multiple pathways through satisfaction. *Journal of Personality and Social Psychology*, *106*(6), 978–996. https://doi.org/10.1037/a0036190

Soto, C. J. (2019). How replicable are links between personality traits and consequential life outcomes? The life outcomes of personality replication project. *Psychological Science*, *30*(5), 711–727. https://doi.org/10.1177/0956797619831612

Soto, C. J., & John, O. P. (2017). Short and extra-short forms of the Big Five Inventory–2: The BFI-2-S and BFI-2-XS. *Journal of Research in Personality*, *68*, 69–81. https://doi.org/10.1016/j.jrp.2017.02.004

Spithoven, A. W. M., Bijttebier, P., & Goossens, L. (2017). It is all in their mind: A review on information processing bias in lonely individuals. *Clinical Psychology Review*, *58*, 97–114. https://doi.org/10.1016/j.cpr.2017.10.003

Stokes, J. P. (1985). The relation of social network and individual difference variables to loneliness. *Journal of Personality and Social Psychology*, *48*(4), 981–990. https://doi.org/10.1037/0022-3514.48.4.981

Summerfield, M., Garrad, B., Nesa, M., Kamath, R., Macalalad, N., Watson, N., Wilkins, R., & Wooden, M. (2024). *HILDA user manual–Release 23*. Melboure Institute: Applied Economic and Social Research.

Sundström, A., Adolfsson, A. N., Nordin, M., & Adolfsson, R. (2020). Loneliness increases the risk of all-cause dementia and Alzheimer's disease. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, *75*(5), 919–926. https://doi.org/10.1093/geronb/gbz139

Surkalim, D. L., Luo, M., Eres, R., Gebel, K., Buskirk, J. van, Bauman, A., & Ding, D. (2022). The prevalence of loneliness across 113 countries: Systematic review and meta-analysis. *BMJ*, *376*, e067068. https://doi.org/10.1136/bmj-2021-067068

Tapia-Munoz, T., Ajnakina, O., Fancourt, D., & Steptoe, A. (2024). Personality traits and loneliness among older people in the UK: Cross-sectional and longitudinal analysis from the English Longitudinal Study of Ageing. *European Journal of Personality*, *38*(4), 599–614. https://doi.org/10.1177/08902070231206196

Thalmayer, A. G., Mather, K. A., Saucier, G., Naudé, L., Florence, M., Adonis, T.-A., Shino, E. N., Asatsa, S., Witzlack-Makarevich, A., Bächlin, L. Z. M., & Condon, D. M. (2025). The cross-cultural big two: A culturally decentered theoretical and measurement model for personality traits. *Journal of Personality and Social Psychology*, *128*(5), 1181–1208. https://doi.org/10.1037/pspp0000528

Thalmayer, A. G., Saucier, G., & Rotzinger, J. S. (2022). Absolutism, relativism, and universalism in personality traits across cultures: The case of the big five. *Journal of Cross-Cultural Psychology*, *53*(7–8), 935–956. https://doi.org/10.1177/00220221221111813

Thalmayer, A. G., Toscanelli, C., & Arnett, J. J. (2021). The neglected 95% revisited: Is American psychology becoming less American? *American Psychologist*, *76*(1), 116–129. https://doi.org/10.1037/amp0000622

Vanhalst, J., Klimstra, T. A., Luyckx, K., Scholte, R. H. J., Engels, R. C. M. E., & Goossens, L. (2012). The interplay of loneliness and depressive symptoms across adolescence: Exploring the role of personality traits. *Journal of Youth and Adolescence*, *41*(6), 776–787. https://doi.org/10.1007/s10964-011-9726-7

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. *Journal of Personality and Social Psychology*, *109*(5), 932–948. https://doi.org/10.1037/pspp0000051

Viechtbauer, W. (2010). Conducting meta-analyses in R with the metafor Package. *Journal of Statistical Software*, *36*, 1–48. https://doi.org/10.18637/jss.v036.i03

Voelkle, M. C., Oud, J. H. L., Davidov, E., & Schmidt, P. (2012). An SEM approach to continuous time modeling of panel data: Relating authoritarianism and anomia. *Psychological Methods*, *17*(2), 176–192. https://doi.org/10.1037/a0027543

von Soest, T., Luhmann, M., Hansen, T., & Gerstorf, D. (2020). Development of loneliness in midlife and old age: Its nature and correlates. *Journal of Personality and Social Psychology*, *118*(2), 388–406. https://doi.org/10.1037/pspp0000219

Wagner, J., Lüdtke, O., Roberts, B. W., & Trautwein, U. (2014). Who belongs to me? Social

    relationship and personality characteristics in the transition to young adulthood.

    European Journal of Personality, *28*(6), 586–603. https://doi.org/10.1002/per.1974

Watson, N., & Wooden, M. P. (2012). The HILDA Survey: A case study in the design and

    development of a successful Household Panel Survey. *Longitudinal and Life Course*

    Studies, *3*(3), Article 3. https://doi.org/10.14301/llcs.v3i3.208

Widiger, T. A., & Oltmanns, J. R. (2017). Neuroticism is a fundamental domain of

    personality with enormous public health implications. *World Psychiatry*, *16*(2), 144–

    145. https://doi.org/10.1002/wps.20411

Wieczorek, L. L., Humberg, S., Gerstorf, D., & Wagner, J. (2021). Understanding loneliness

    in adolescence: A test of competing hypotheses on the interplay of Extraversion and

    Neuroticism. *International Journal of Environmental Research and Public Health*,

    18(23), Article 23. https://doi.org/10.3390/ijerph182312412

World Health Organization. (2023). *WHO launches commission to foster social connection*.

    World Health Organization. https://www.who.int/news/item/15-11-2023-who-

    launches-commission-to-foster-social-connection

Wright, A. J., & Jackson, J. J. (2023). Do changes in personality predict life outcomes?

    Journal of Personality and Social Psychology, *125*(6), 1495–1518.

    https://doi.org/10.1037/pspp0000472

Wu, X., Huebner, E. S., & Tian, L. (2024). Developmental trajectories of loneliness in

    Chinese children: Environmental and personality predictors. *Journal of Affective*

    Disorders, *367*, 453–461. https://doi.org/10.1016/j.jad.2024.08.228

Yu, B., Liu, Y., Li, Y., & Wu, Q. (2023). Cross-sectional and prospective relationships

    between Neuroticism and depressive symptoms among college students: The

mediating role of loneliness. *Psychological Reports*, 00332941231191065.

https://doi.org/10.1177/00332941231191065

Zautra, A. J., Affleck, G. G., Tennen, H., Reich, J. W., & Davis, M. C. (2005). Dynamic

approaches to emotions and stress in everyday life: Bolger and Zuckerman reloaded

with positive as well as negative affects. *Journal of Personality*, *73*(6), 1511–1538.

https://doi.org/10.1111/j.0022-3506.2005.00357.x

Zeiss, A. M., & Lewinsohn, P. M. (1988). Enduring deficits after remissions of depression: A

test of the scar hypothesis. *Behaviour Research and Therapy*, *26*(2), 151–158.

https://doi.org/10.1016/0005-7967(88)90114-3