Social Policy and Public Health

On the relationship between personality traits and loneliness in the COVID-19 pandemic

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Abstract

There is a suspicion that the COVID-19 pandemic has affected levels of loneliness in the Netherlands. Pre-pandemic research indicates a link between certain personality traits and social- and emotional loneliness-development. This paper explored if the pandemic produced any noticeable changes in this relationship. Longitudinal data provided by the Dutch LISS-panel (n=4180) was analyzed to assess the relationship between personality traits and the 2020 scores for the two types of loneliness (while controlling for 2019 scores of loneliness and known covariates).

For social loneliness in 2020 the overall regression was statistically significant ($R^2 =$ .445, $F (12, 4167) = 278.785$, $p < .001$). Agreeableness ($\beta = -.261$, $p = .001$), conscientiousness ($\beta = -.209$, $p = .007$), extraversion ($\beta = -.048$, $p < .001$) neuroticism ($\beta =$ .102, $p < .001$) and an interaction of agreeableness and conscientiousness ($\beta = .323$, $p = .008$) were found to be significant predictors. For emotional loneliness in 2020 the overall regression model was statistically significant ($R^2 = .406$, $F (12, 4167) = 237.084$, $p < .001$). Agreeableness ($\beta = -.178$, $p = .024$), conscientiousness ($\beta = -.236$, $p = .003$), neuroticism ($\beta =$ .163, $p < .001$) and the interaction between agreeableness and conscientiousness ($\beta = .338$, $p = .008$) were found to be significant predictors. Extraversion ($\beta = -.011$, $p = .400$) was not significantly associated with changes in emotional loneliness.

While the majority of personality traits significantly predicted changes in social and emotional loneliness, the amount of additional explained variance by these traits was fairly small ($\Delta R^2 = .019$ for social loneliness, $\Delta R^2 = .025$ for emotional loneliness). This was probably due to the research controlling for the previous years' loneliness scores. This research did, however, unveil the necessity for loneliness research to analyze social and emotional loneliness separately.

1. Introduction

In paragraph 1.1 the topic of loneliness is introduced, alongside a short description of why loneliness-research now is more pressing than ever. In paragraph 1.2 the relationship between loneliness and personality is described, alongside recent developments in loneliness research in the pandemic. This is followed by the problem statement and goal of this thesis.

1.1 Loneliness and the COVID-19 pandemic

The COVID-19 pandemic and the measures that were taken to prevent the spread of the virus have had many consequences for social support structures in Dutch society. Cafés were closed, as well as schools, libraries, gyms, pools, shops, neighborhood centers, and much, much more. The limitations on face-to-face contact imposed a strict social diet on many, which most likely has had a myriad of effects. One of these effects seems to be the rising prevalence of loneliness. Measurements by the RIVM (the Dutch Governmental Institute for Public Health and Environmental Hygiene) show that in 2016, 43% of those interviewed reported moderate to severe loneliness (RIVM, 2016). In November of 2020 – early in the second Dutch lockdown – 60% of respondents reported feeling moderately to severely lonely (RIVM, 2021).

Feeling lonely is an undesirable experience. That in itself is a good argument for wanting to reduce loneliness among the general population. But there are also other motivations for seeking a reduction in loneliness: loneliness has been shown to have a significant detrimental effect on one's health (Leigh-Hunt et al., 2017). Loneliness affects all-cause mortality (Holt Lunstad et al., 2015), wellbeing (Chen & Feely, 2014) and cardiovascular health (Cuffee et al., 2015), and is a consequential risk factor in the development of mental illness (Santini et al., 2015; Teo, Lorrigo & Rogers, 2013). It is also associated with a higher risk of tobacco-use (Dyal & Valente, 2015), unhealthy diets (Van der Pols-Vijlbrief et al., 2014) and dementia (Kuiper et al., 2015).

1.2 Scientific relevance and problem statement

Temporary feelings of loneliness are quite common and natural. But prolonged periods of loneliness are associated with low self-evaluation that can lead to an attitude of hypervigilance (perceiving social threats when there are none) and other maladaptive social cognitions (Cacciopo et al., 2015). This maladaptive social cognition, in turn, can promote emotional regulation strategies of experiential avoidance. It transforms a temporal state of loneliness into a long-term affliction (Cacciopo et al., 2015; Mental Health Foundation, 2010). In pre-pandemic research (Buecker, Maes, Denissen & Luhmann, 2020) personality traits are generally found to be significant predictors of loneliness. Recent smaller-scale research from Switzerland (Gubler, Makowski, Trochler & Schlegel, 2020) has suggested that some the associations between personality and loneliness have been impacted by the pandemic.

It seems probable that the reported increase in the prevalence of loneliness (RIVM, 2020) could have significant effects on mental (and eventually physical) public health. Therefore, it is essential that we better understand how the pandemic has affected loneliness among the Dutch population. The purpose of this study is to investigate the changes in loneliness among the Dutch population: expanding our knowledge in this respect could be useful to more accurately identify if the mechanisms leading to loneliness have been altered, and with that gain a better handle on helping at-risk populations.

2. Existing research and theory

To better understand the factors influencing loneliness the existing but fragmented research on the topic is examined. In loneliness research many different definitions and measurement scales are used, and this hinders the comparability of data.

To get a sense of the different perspectives out there, the dominant streams in loneliness research and their strong and weak points are described in paragraph 2.1. Research on the relationship between loneliness and personality is expanded on in paragraph 2.2. Other confounding factors are identified in paragraph 2.3. These different perspectives are then integrated in paragraph 2.4. In paragraphs 2.5 and 2.6 it is considered how these mechanisms of loneliness might be affected by the COVID-19 pandemic.

2.1 Theories of loneliness

Loneliness is a grand term, similar to words like 'love', 'freedom' or 'economy': many competing definitions and measures are used in common speech and scientific literature (Tzouvara, Papadopoulos & Randhawa, 2015). When defining loneliness it is important to be aware of the distinction between 'aloneness' and 'loneliness'. Somebody can be alone, but not be lonely. And somebody can be lonely while surrounded by others. Loneliness, then, is the gap between desired social connection and realized or perceived social connection (de Jong-Gierveld, 1978).

2.1.1 The interactionist perspective

The interactionist perspective is based on attachment theory, proposing that loneliness is caused by the absence of an adequate social network and the lack of an intimate figure. This approach was popularized by the works of Robert Weiss (1973), who proposed that there are two types of loneliness: emotional and social loneliness.

Emotional loneliness refers to the absence of a close attachment figure, caused by shortcomings in current intimate relationships, or by the disappearing of these relationships through divorce, death or other causes. *Social loneliness* refers to the lacking of a broader social network and feelings of belonging (Cacioppo, et al., 2015; Weiss, 1973). The two dimensions tend to correlate, but are ultimately distinct from each other (Buecker, Maes, Denissen & Luhmann, 2020; Dahlberg & Mckee, 2014).

The interactionist approach is criticized for focusing too much on absence of contact, and not on what other factors can contribute to the experience, such as age, gender, culture and psychological processes (Tzouvara, Papadopoulos, Randhawa, 2015).

2.1.2 The cognitive perspective

The cognitive perspective (based on attribution theory) accentuates the importance of cognitive processes shaping the experience of loneliness (Tzouvara, Papadopoulos & Randhawa, 2015). Loneliness is described as being the perceived gap between achieved and desired relationships (Peplau & Perlman, 1981). It emphasizes situational and environmental attributions, and takes into account behavioral factors and personality traits. Cognitive processes are a mediating factor and can manipulate the experience of loneliness: one can work on one's social skills, try to change the attribution of social experiences, and influence the level of self-esteem. The theory addresses the factors influencing the subjective experience of loneliness, as well as factors that influence the behavioral aspects of loneliness. The cognitive perspective is lacking in its addressing of social and cultural factors.

2.2 Loneliness and personality traits

When looking at factors of influence on the individual level in more detail, personality traits appear to have a major influence. A common way to conceptualize personality traits is by way of the five-factor model referred to as the 'big five' (McCrae & Costa, 2008). Simply put, the five factors refer to extraversion (being outgoing), agreeableness (being compassionate), openness (being curious), conscientiousness (being organized) and neuroticism (being sensitive).

Buecker, Maes, Denissen and Luhmann (2020) performed a meta-analysis on 113 studies measuring the relationship of loneliness and the big five personality traits (n = 93.668). They found that four out of five personality traits correlated significantly with loneliness. Agreeableness (r=-.243) and conscientiousness (r=-.202) presented a smaller but significant association with loneliness. Neuroticism (r=.358) and extraversion (r=-.370) had the largest effect-sizes by some margin.

Neuroticism is associated with a heightened sensitivity to social rejection (Vater & Schröder-Abé, 2015), and individuals scoring higher on neuroticism are often described as less likeable by their peers (Van der Linden et al., 2010). The correlation between extraversion and loneliness is negative; extraverted people tend to seek out more social engagements (Lucas, Le & Dyrenforth, 2008) and are generally better liked by their peers than less extraverted people (Van der Linden et al., 2010). The relationship between personality traits and loneliness development reportedly is mediated by emotion regulation strategies (Shi et al., 2016). It seems possible that this fact plays an important role in seeking out and experiencing more fulfilling social engagements.

2.3 Most affected populations and environmental risk factors

Loneliness is experienced through all layers of society, but some populations seem to be at a higher risk of experiencing the phenomenon than others. Having a partner, a parent or a child in the house seems to be an important factor in the prevention of loneliness. The household configuration in which somebody lives is most often found to be the strongest predictor (Beutel et al, 2017).

Other studies (Diehl, Jansen, Ischanova & Hilger-Kolb, 2018) show that there are also noticeable effects of age, gender and educational level on experienced loneliness. There are also interactions of age and gender reported (Beutel et al., 2017). Women living alone below age forty-five reported feeling lonelier than their male counterparts. Above age forty-five, it is single men who appear to feel lonelier. From age sixty-five onwards loneliness seems to decline over the whole population. The importance of at least some of the determinants of loneliness seems to fluctuate throughout the life course.

The higher prevalence of loneliness among youngsters can be explained by a few factors. It is a group that is extra vulnerable to development of maladaptive social cognitions and negative self-evaluation (Vanhalst et al., 2013). They also tend to have fewer, less stable romantic relationships, and live in smaller households. It is a period in life where the social environment of the individual tends to change (Qualter et al., 2015). Youngsters leave the familial home, move to other cities and have to reshuffle their friend-groups and social support systems. For older people, similar disruptions in the social sphere lead to a rise in levels of loneliness: the death of a loved one, reduced contact with children, or an exit from a workplace are strongly correlated with rising levels of loneliness (Dahlberg & McKee, 2014).

2.4 Integration of perspectives

The approaches described in paragraphs 2.1, 2.2 and 2.3 are distinct, but supplement each other in the analysis of loneliness. The social and emotional experiences of loneliness of the interactionist approach give a good idea of the two continua whereon this perceived connectedness can exist. Empirical evidence shows that the two dimensions of loneliness share only about 20% of variance (Dahlberg & Mckee, 2014), indicating that a two-continua conceptualization is valid. While the cognitive perspective on loneliness does not directly address this two-continua model of loneliness, it does provide a basis to think about psychological and behavioral mediators of the two types of loneliness, like personality and coping strategies. When these approaches are combined, and the empirical knowledge on known environmental risk factors for loneliness is added a more complete model of the phenomenon can be constructed. A schematic representation of this model is presented in Figure 1.

Figure 1: A schematic representation of the various perspectives on loneliness
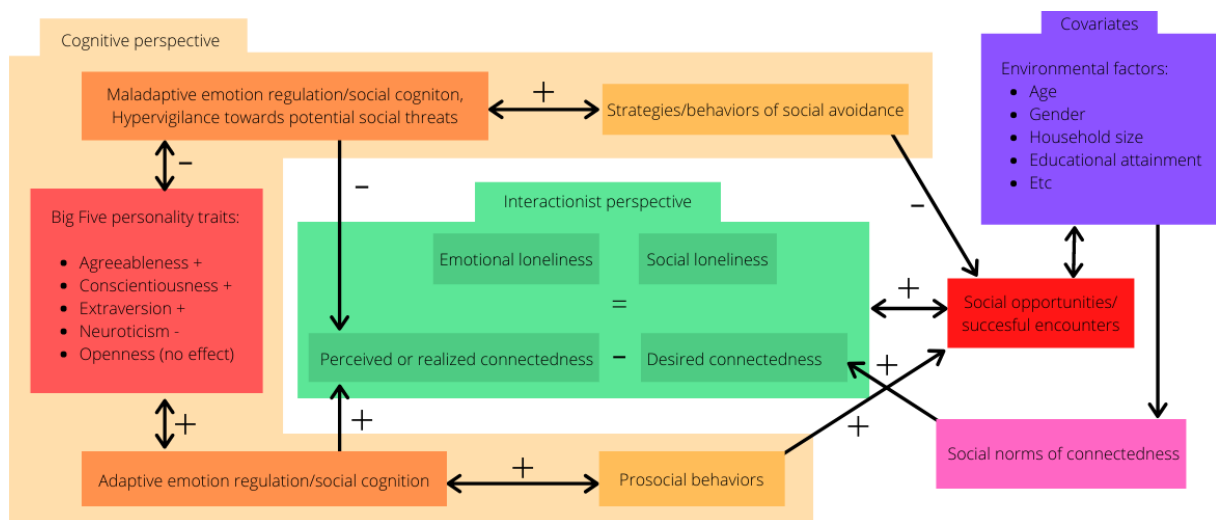
2.5 Loneliness and COVID-19: prevalence and opposing trajectories of social and emotional loneliness

It was mentioned in the introduction of this paper that the prevalence of loneliness seems to have risen dramatically in 2020, with 60% of the population experiencing moderate to severe loneliness in November 2020 (RIVM, 2021). However, this rise has not been uniform across all datasets: data assembled by the LISS panel (Longitudinal Internet studies for the Social Sciences panel) in November 2020 shows mutations in the prevalence of loneliness within the range of 3% (De Klerk et al., 2021). It is possible that the COVID-specific framing of the

RIVM questionnaires has had a significant influence on responses. This specific framing is not present in the loneliness measures of the LISS panel.

That same LISS panel offered another remarkable insight: while emotional loneliness has risen slightly in the general population – and significantly among those aged 65 and above – (Van Tilburg et al., 2020), social loneliness seems to have gone down (De Klerk et al., 2021). How this decline is to be interpreted remains a question for now.

2.6 Loneliness and COVID-19: an altered relationship between personality and loneliness?

Much research has been done on the relation between personality traits and loneliness (Buecker, Maes, Denissen & Luhmann, 2020). Emotion regulation strategies are reported to play an important mediating role in predicting loneliness, and the capacity for applying these strategies has likely been impacted by the pandemic and its associated measures.

Research by Gubler, Makowski, Trochler and Schlegel (2020) in Switzerland indicates that the usual correlations between personality traits and loneliness development are not as apparent in the data they collected during the COVID-19 lockdown. Particularly extraversion, usually considered a strong protective factor for loneliness, now appeared to have lost its relevance as a predictor of loneliness. It is suggested that the reduction in opportunities for social engagement may have played a role in this mutation.

The sample used by Gubler, Makowski, Trochler and Schlegel is quite small, and the researchers used a scale that failed to make the distinction between social and emotional loneliness, two dimensions that seem to have developed in different directions during the pandemic (De Klerk et al., 2021). These limitations ask for further research that takes a look at the association between the two continua of loneliness and personality traits in the COVID-19 pandemic. Unfortunately there are no direct measures of this sample's emotion regulation strategies, but by employing a design that analyzes the influence of the big five personality traits on social and emotional loneliness separately a clearer picture of who is vulnerable to what type of loneliness can be constructed.

3. Research question and hypotheses

The theoretical perspectives and recent developments introduced above lead us to ask to the following question:

> *What is the relationship between the big five personality traits and the development of the two types of loneliness during the COVID-19 pandemic?*

While it is clear that there is a relationship between personality traits and loneliness (Buecker, Maes, Denissen & Luhmann, 2020), it is possible that the changing environmental conditions have had an influence on the strength of these associations. Neuroticism is traditionally most associated with loneliness, followed by extraversion. Extraversion is considered to be an insulating factor, but it is suggested that the COVID-19 lockdown has reduced the strength of this association (Gubler, Makowski, Troche & Schlegel, 2020).

The data put forward by De Klerk et al. (2021) describes a split between the development of social and emotional loneliness. The first has gone down, and the second has risen slightly. This split is remarkable since social and emotional loneliness are usually considered to be closely related. To explore any possible differences in the association between personality traits and the two types of loneliness, the main research question is split up into two sub-questions:

- *What is the relationship between the big five personality traits and social loneliness during the COVID-19 pandemic?*
- *What is the relationship between the big five personality traits and emotional loneliness during the COVID-19 pandemic?*

Going by current knowledge on the topic, it is expected that agreeableness and conscientiousness are negatively associated with social loneliness development in the COVID-19 pandemic. Neuroticism is projected to remain positively associated with the outcome variable. Extraversion is hypothesized to have lost its significant negative association with social loneliness development in the pandemic. It is not expected that openness is associated with social loneliness.

Similar to social loneliness, agreeableness and conscientiousness are projected to be negatively associated with emotional loneliness development during the pandemic. It is estimated that neuroticism remains positively associated, while extraversion is estimated to have no significant negative association with emotional loneliness development. Existing research does not give any indication to expect any associations of openness with emotional loneliness.

4. Methods

In this chapter the methodology of this research is described. In paragraph 4.1 a rationale is given for the elected design. In paragraph 4.2 the research population and sampling methods

are discussed, while in paragraph 4.3 a closer look at the data collection-instruments is provided. Paragraph 4.4 concerns itself with the data management protocol, while paragraph 4.5 considers the appropriate method for data analysis.

4.1 Design and suitability

To answer the research questions posed in chapter 3 a longitudinal study design is required; scores of social and emotional loneliness from before (measured in November 2019) and during the pandemic (measured in November 2020) are compared to see how development of loneliness scores correlate with the big five personality traits (measured in May and June 2020) and the relevant covariates.

Due to the different times at which personality and loneliness were measured inaccuracies of these measurements among this sample are expected: personality traits are subject to change, especially in younger adults (Roberts & Mroczek, 2008). However, year-over-year changes are generally small. Since the timeframe of the study only spans one year it is presumed that these changes can be considered negligible. The aim is to test if known risk factors for loneliness development remain relevant in the context of loneliness development in the COVID-19 pandemic. Therefore, this study is deductive and quantitative in nature.

4.2 Population and sampling

This research concerns itself with Dutch residents. The dataset used in this research is sourced from the LISS panel. The LISS panel consists of 7.500 individuals spread across 5.000 households, who are selected by taking a true probability sample of households drawn from the population register of Statistics Netherlands (*About the Panel*, n.d.). All people in the sample were invited to participate by letter, followed by a telephone call or a house visit (*Sample and Recruitment,* n.d.). People without a prior connection to the internet were loaned equipment to enable them to participate.

The panel members are invited on a monthly basis to complete questionnaires for which they receive monetary compensation. In 2019 the average individual monthly response rate was 80,42% (*Composition and Response*, n.d.). Respondent attrition is about 12% per year, with old age (75+) being the variable with the highest correlation to attrition. Leaning on assistance of Statistics Netherlands, various stratified refreshment samples have been recruited over the years to improve representativeness of the panel, selecting for a representative distribution on variables as household type, age and ethnicity (*Sample and Recruitment*, n.d.).

To participate in the panel, entry of general characteristics are obligatory. As such, variables as age, gender, household composition and educational attainment are answered by all of the participants. The LISS panel does not allow for partially completed questionnaires to be submitted. However, not all panel members participated in every questionnaire relevant to this particular research. Selecting only the cases that contain all relevant datapoints leaves us with a sample size of 4180 participants, effecting a slight overrepresentation of older (60+) participants. Additional characteristics of this sample are described in Table 1 and Figure 2.

Table 1: Additional sample characteristics

	N	%
Gender		
Male	1974	47.2
Female	2206	52.8
Educational attainment		
Primary	267	6.4
Intermediate secondary	889	21.3
Higher secondary	451	10.8
Intermediate vocational	981	23.5
Higher vocational	1061	25.4
University	531	12.7
Size of household		
1	945	22.6
2	1886	45.1
3	448	10.7
4	586	14
5	246	5.9
6	55	1.3
7	12	0.3
8	2	.05

n = 4180

Figure 2: Distribution of age in sample
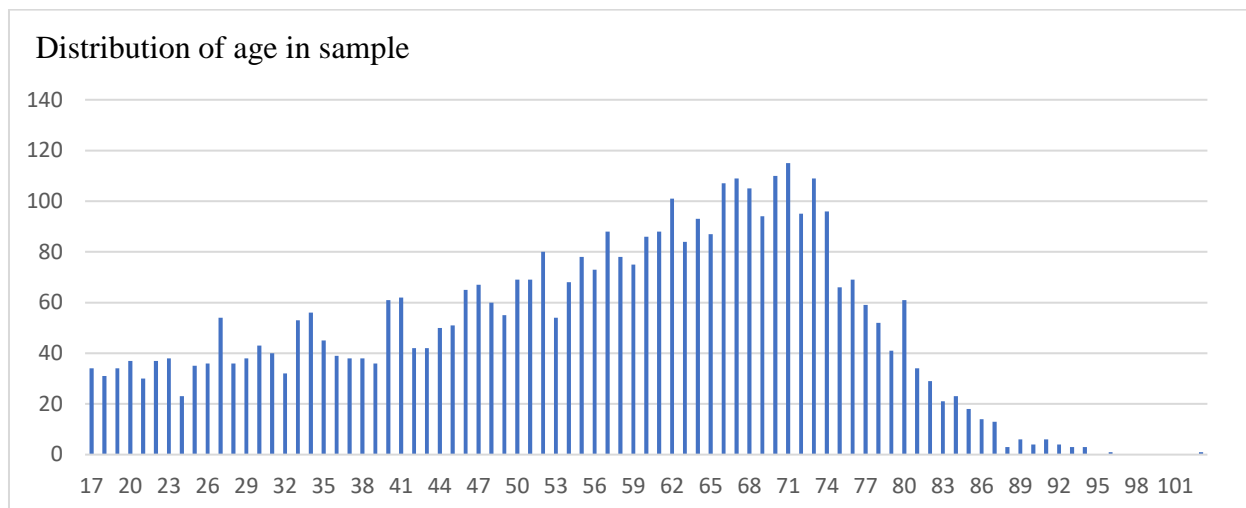
4.3 Data collection instruments

4.3.1 Loneliness

The measurements of loneliness were collected between October 7, 2019 and November 26, 2019 for the first wave, and between October 5, 2020 and November 11, 2020 for the second wave. This holds that there is one measuring point before the COVID-19 crisis, and one relatively early into the second Dutch lockdown.

The De Jong-Gierveld scale splits up loneliness in two subscales, measuring emotional and social loneliness as separate items. The scale has been validated across various countries and age groups (Penning, Liu & Chou, 2014; De Jong-Gierveld & van Tilburg, 2010). In this version of the de Jong-Gierveld scale six questions were asked, and three possible response categories were given: 'no', 'more or less' and 'yes'. The questions about emotional loneliness were worded negatively ('I have a sense of emptiness around me'; 'I miss having people around me' and 'I often feel deserted'). Positive and neutral answers count towards an emotional loneliness score ranging from 0 to 3. The questions on social loneliness were worded positively ('There are enough people I can count on in case of a misfortune'; 'I know a lot of people I can fully rely on' and 'There are enough people to whom I feel closely connected'). Negative and neutral answers counted towards a social loneliness score ranging from 0 to 3.

4.3.2 Personality Traits

Personality traits were measured by way of the IPIP (International Personality Item Pool) between May 4 and June 30 of 2020. The IPIP is designed to capture the big five personality

traits, and has been validated across many cultures and age-groups (Donnellan, Oswald, Baird & Lucas, 2006). Fifty statements were asked to measure the five personality traits: agreeableness, ('I am interested in people'), conscientiousness ('I am exact in my work'), extraversion ('I am the life of the party'), neuroticism ('I get stressed out easily') and openness ('I am full of ideas'). The fifty statements alternated between the different personality traits and were formulated negatively as well as positively to prevent acquiescence bias.

Respondents were asked to answer on a 5-point scale to what capacity they agree with the statements, with answering options ranging from 'totally disagree' to 'totally agree'. This led to scores on the different personality traits ranging from 10 to 50, with higher scores indicating higher levels of the personality trait.

4.3.3 Covariates

Measuring the relevant covariates provided by existing research is straightforward. Age was reported as a simple number. Gender was directly measured within *male* or *female* answer categories.

Highest attained educational level was measured directly in the LISS panel, with *primary school* (1), *intermediate secondary education/vmbo* (2), *higher secondary education/havo* (3), *intermediate vocational education/mbo* (4), *higher vocational education/hbo* (5) and *university* (6) as the options for answering.

The number of household members was measured directly. There were nine possible answer categories, ranging from one-person households to households with nine or more members.

4.3 Data management

The relevant data was downloaded directly from the LISS panel website and stored on Utrecht University's secure YoDa data storage environment. Here the LISS data was cleaned, transcoded, and aforementioned scales were constructed. Respondents that did not enter all relevant information have been excluded from the analysis. Subsequent analyses, SPSS data files and output, as well as all other documents and sources used in this research were also stored in YoDa.

4.4 Data analysis

To answer the research questions it was necessary to run two analyses: one with social loneliness and one with emotional loneliness as the dependent variable. The social and emotional loneliness dependent variables – although having only four possible values – were

both treated as continuous. Some recoding was necessary to let higher scores on the questionnaire items correspond to higher scores on emotional and social loneliness. Similar recoding was also required for the personality scores. The predictor variables used are continuous, with gender and educational attainment being categorical exceptions.

The choice was made to analyze the data via a hierarchical regression. In the first step the loneliness scores of the previous year were included. In the second step the control variables deemed relevant by existing loneliness research were added: age, gender, educational attainment and household size. In the literature on loneliness, interaction effects of age and gender are also reported (Bu, Steptoe & Fancourt, 2020), and as such this interaction was included in the second step. In the third step of the model scores on the various personality traits have been included. The meta-analysis performed by Buecker, Maes, Denissen and Luhmann (2020) has suggested that there might also be interaction effects of the various personality traits in relation to loneliness. For this reason all significant interaction terms of the independent variables were included in a fourth step, and interactions that did not reach significance were deleted. This way of modelling allowed to check for any significant interactions that might obfuscate the structure of the data, and helped to find the model that best explained the variance of the dependent variables.

5. Results

In this chapter the results of the analyses are presented. In paragraph 5.1 descriptive statistics of the relevant dependent and independent variables are given. In paragraph 5.2 the hierarchical regression addressing social loneliness is presented. In paragraph 5.3 the same is done for the hierarchical regression concerning emotional loneliness.

5.1 Descriptive statistics and internal consistency

Means, standard deviations and internal consistency (assessed using Cronbach's alfa) of all assembled scales are presented in table 2.

Table 2: Means (M), standard deviations (SD) and Cronbach's alpha (α) for all scales

	M	SD	α
IPIP Agreeableness	38.39	5.27	0.83
IPIP Conscientiousness	37.46	5.24	0.79
IPIP Extraversion	31.78	6.75	0.89
IPIP Neuroticism	24.69	7.09	0.89
IPIP Openness	34.76	5.05	0.77
DJ-G Social Loneliness 2019	0.99	1.19	0.79
DJ-G Social Loneliness 2020	0.95	1.18	0.81
DJ-G Emotional Loneliness 2019	0.63	1.05	0.82
DJ-G Emotional Loneliness 2020	0.70	1.04	0.77

Note: IPIP, International Personality Pool; DJ-G, De Jong Gierveld Short Scale for Loneliness

The constructed scales are internally consistent, with Cronbach's alphas ranging from 0.77 to 0.89. Zero-order correlations for all variables are included in the appendix.

A paired samples t-test (table 3) confirms that social (t = -3.023, p = .003) and emotional loneliness (t = 4.467, p < .001) scores in 2020 both differ significantly from the measures taken in 2019. How these changes in social loneliness are distributed can be viewed in more detail in table 4.

Table 3: Paired differences between the two types of loneliness scores in 2020 and 2019

|	Mean (CI)	SD	t	df	Sig. (2-tailed)
Social loneliness in 2020 compared to 2019	-.046 (-.016; -.076)	0,988	-3.023	4179	.003
Emotional loneliness in 2020 compared to 2019	.063 (.091; .035)	0,914	4.467	4179	.000

Note: CI = 95% Confidence interval mean, SD = Standard deviation

Table 4: Frequencies of social loneliness scores

	2019		2020		Change	
Social loneliness scores	n	%	n	%	n	%
0	2147	51.4	2252	53.9	105	4.9%
1	701	16.8	662	15.8	-39	-5.6%
2	531	12.7	487	11.7	-44	-8.3%
3	801	19.2	779	18.6	-22	-2.7%

In table 4 it can be seen that social loneliness has gone down slightly; the groups with low to high scores on social loneliness have shrank between 2,7% and 8,3%, and the group reporting no social loneliness at all grew by 4,9%. In total, moderate to severe social loneliness was reduced from 32,9% in 2019 to 30,3% in 2020. The distribution of change scores is presented in figure 3, where it can be seen that the majority of the population reported no change in levels of social loneliness.

**Figure 3:** Histogram of social loneliness changes
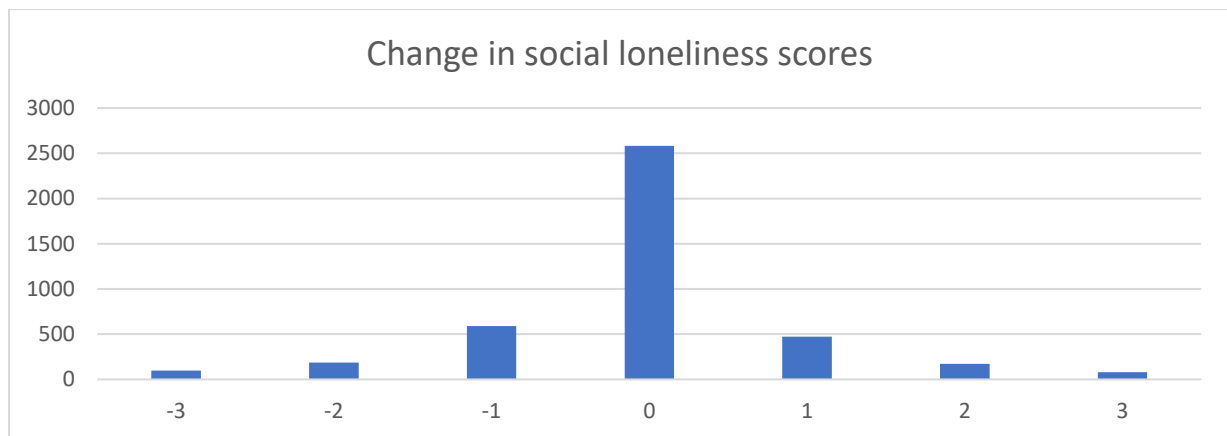
Table 5: Frequencies of emotional loneliness scores

	2019		2020		Change	
Emotional loneliness scores	n	%	n	%	n	%
0	2853	68.3	2633	63	-220	-7.7%
1	466	11.1	592	14.2	126	27.0%
2	386	9.2	530	12.7	144	37.3%
3	475	11.4	425	10.2	-50	-10.5%

In table 5 the changes in *emotional loneliness* are described. Slight to moderate emotional loneliness has risen significantly compared to 2019, feeding from the extremes on both ends of the emotional loneliness spectrum. The share of people with moderate to severe emotional loneliness grew from 20,6% of the sample to 22,9%. The distribution of emotional change scores is presented in Figure 4, that shows that the majority of the population reported no change in levels of emotional loneliness.

Figure 4: Histogram of emotional loneliness changes
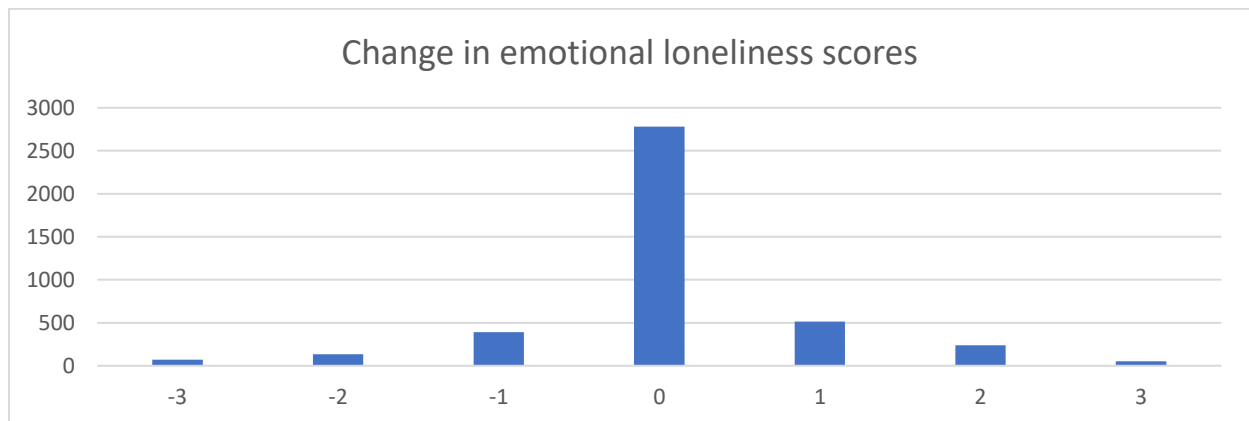
5.2 Social loneliness

The results of the hierarchical multiple regression with social loneliness in 2020 as the dependent variable are presented in t~~T~~able ~~8~~6. In the first step the control variable social loneliness score in 2019 was entered, which by itself explained 42.6% of variance ($R^2 = .426$, $p < .001$). In the second step the covariates suggested by the literature were added to the model. This did not increase the amount of explained variance significantly ($R^2 = .426$, $p = .152$). In the third step the IPIP big five personality traits were introduced as predictors. Agreeableness and extraversion were negatively associated with loneliness in 2020, and neuroticism was associated positively. This third step accounted for another 1.8% of explained variance ($R^2 = .443$, $p < .001$). In the fourth step ($R^2 = .444$, $p = .008$) all possible interactions between the various personality traits were introduced in a stepwise fashion. This step resulted in one significant two-way interaction term: that between agreeableness and conscientiousness, explaining an additional 0.1% of variance.

For social loneliness in 2020 the overall regression was statistically significant ($R^2 = .444$, $F (12, 4167) = 278.785$, $p < .001$). Agreeableness ($\beta = -.261$, $p = .001$), conscientiousness ($\beta = -.209$, $p = .007$), neuroticism ($\beta = .102$, $p < .001$) were significantly associated in the directions that were in line with the relevant hypotheses. Openness ($\beta = .018$, $p = .185$) not being a significant predictor was also expected. An interaction of agreeableness and conscientiousness ($\beta = .323$, $p = .008$) was found to be significant here as well. Extraversion ($\beta = -.048$, $p < .001$) was found -contrary to what was hypothesized- to be significantly negatively associated with social loneliness development during the pandemic. Age was the only significant covariate ($\beta = .039$, $p < .022$).

5.3 Emotional loneliness

The results of the hierarchical multiple regression for emotional loneliness are presented in Table 79. In the first step the control variable emotional loneliness in 2019 was entered, which explained 37.9% of variance ($R^2 = .379$, $p < .001$). In the second step the covariates were added. This increased the amount of explained variance slightly but significantly ($R^2 = .380$, $p = .004$). In the third step the IPIP big five personality traits again were introduced as predictors. This third step accounted for another 2.4% of explained variance ($R^2 = .403$, $p < .001$). In the fourth step all possible interactions between the various personality traits were introduced in a stepwise fashion. This method left us with a similar significant interaction term as in the social loneliness analysis: the interaction between agreeableness and conscientiousness ($R^2 = .404$, $p = .008$).

For emotional loneliness in 2020 the overall regression model was statistically significant ($R^2 = .404$, $F (12, 4167) = 237.084$, $p < .001$). Agreeableness ($\beta = -.178$, $p = .024$), conscientiousness ($\beta = -.236$, $p = .003$), neuroticism ($\beta = .163$, $p < .001$) and an interaction of agreeableness and conscientiousness ($\beta = .338$, $p = .008$) were found to be significant predictors, as well as the amount of members in the household ($\beta = -.033$ $p = .013$). Extraversion ($\beta = -.011$, $p = .400$) and openness ($\beta = .008$, $p = .554$) did not significantly predict emotional loneliness in 2020. As such, all previously formulated hypotheses on the relationship between personality traits and emotional loneliness development could not be rejected. Household size was the only significant covariate ($\beta = -.033$, $p = .013$).

Table 6: Hierarchical regression with social loneliness 2020 as dependent variable

	B (CI)	SE B	β	t-value	_p_ value
Step 1					
(Intercept)	.302 (.267; .338)	.018		16.69	
Social loneliness in 2019	.650 (.627; .673)	.012	.652	55.64	.000***
	$F(1) = 3096.216$, Adjusted $R^2 = .426$, $p < .001$***				
Step 2					
(Intercept)	.379 (.197; .561)	.093		4.089	
Social loneliness in 2019	.648 (.625; .671)	.012	.650	55.108	.000***
Age	.000 (-.002; .002)	.001	.005	.271	.787
Educational attainment	-.018 (-.037; .000)	.009	-.023	-1.928	.054
Number of members in household	.003 (-.021; .026)	.012	.003	.207	.836
Gender	-.068 (-.167; .031)	.051	-.029	-1.340	.180
Age * Gender	.014 (-.058; .087)	.037	.009	.387	.699
	$F(6) = 517.763$, Adjusted $R^2 = .426$, $ΧR^2 = .001$, $p = .152$				
Step 3					
(Intercept)	.593 (.223; .963)	.189		3.144	
Social loneliness in 2019	.595 (.571; .620)	.012	.597	47.742	.000***
Age	.002 (.000; .005)	.001	.036	2.109	.035*
Educational attainment	-.008 (-.028; .011)	.010	.011	-.842	.400
Number of members in household	.005 (.018; .029)	.012	.005	.423	.673
Gender	-.053 (-.156; .049)	.052	-.023	-1.023	.306
Age * Gender	.011 (-.061; .083)	.037	.007	.303	.762
Agreeableness	-.014 (-.020; -.008)	.003	-.064	-4.568	.000***
Conscientiousness	-.002 (-.008; .004)	.003	-.009	-.683	.494
Extraversion	-.008 (-.013; -.004)	.002	-.047	-3.608	.000***
Neuroticism	.017 (.013; .021)	.002	.102	7.748	.000***
Openness	.004 (-.002; .010)	.003	.017	1.247	.212
	$F(11) = 303.058$, Adjusted $R^2 = .443$, $ΧR^2 = .018$, $p < .001$***				
Step 4					
Intercept	2.261 (.970; 3.551)	.658		3.434	
Social loneliness in 2019	.594 (.569; .618)	.012	.596	47.623	.000***
Age	.003 (.000; .005)	.001	.039	2.293	.022*
Educational attainment	-.007 (-.026;.012)	.010	-.009	-.727	.468
Number of members in household	.004 (-.019; .028)	.012	.005	.367	.714
Gender	-.046 (-.149; .056)	.052	-.020	-.889	.374
Age * Gender	.006 (-.066; .078)	.037	.004	.168	.866
Agreeableness	-.059 (-.092; -.025)	.017	-.261	-3.439	.000***
Conscientiousness	-.047 (-.081; -.013)	.017	-.209	-2.721	.007**
Extraversion	-.008 (-.013;-.004)	.002	-.048	-3.713	.000***
Neuroticism	.017 (.013; .021)	.002	.102	7.737	.000***
Openness	.004 (-.002; .011)	.003	.018	1.327	.185
Agreeableness * Conscientiousness	.001 (.000; .002)	.000	.323	2.644	.008**
	$F(12) = 278.785$, Adjusted $R^2 = .444$, $ΧR^2 = .001$, $p = .008$**				

Note: N = 4180. B = Unstandardized regression weight, CI = 95% Confidence Interval of unstandardized regression weight (B), SE (B) = Standard Error of unstandardized regression weight. β = Standardized regression weight. For Gender, 0 = male, 1 = female.
* $p < .05$, ** $p < .01$, *** $p < .001$

Table 7: Hierarchical regression with emotional loneliness 2020 as dependent variable

	B (CI)	SE B	β	t-value	*p* value
Step 1					
(Intercept)	.313 (.284; .342)	.015		21.135	
Emotional loneliness in 2019	.609 (.585; .632)	.012	.615	50.460	.000***
	$F(1) = 2546.198$, Adjusted R^2 = .379, $p < .001$***				
Step 2					
(Intercept)	.452 (.285; .619)	.085		5.319	
Emotional loneliness in 2019	.604 (.580; .628)	.012	.611	49.252	.000***
Age	-.002 (-.004; .000)	.001	-.027	-1.537	.124
Educational attainment	-.005 (-.022; .012)	.009	-.008	-.598	.550
Number of members in household	-.028 (-.050; -.007)	.011	-.034	-2.554	.011*
Gender	.041 (-.049; .131)	.046	.020	.889	.374
Age * Gender	.029 (-.037; .095)	.034	.021	.856	.392
	$F(6) = 285.095$, Adjusted R^2 = .380, ꭓR^2 = .003, $p = .004$**				
Step 3					
(Intercept)	-.187 (-.518; .145)	.169		-1.105	
Emotional loneliness in 2019	.546 (.520; .571)	.013	.552	42.099	.000***
Age	.000 (-.002; .002)	.001	-.006	-.320	.749
Educational attainment	.002 (-.015; .020)	.009	.003	.145	.885
Number of members in household	-.026 (-.048; -.005)	.011	-.032	-2.427	.015*
Gender	-.036 (-.129; .056)	.047	-.018	-.770	.441
Age * Gender	.042 (-.023; .107)	.033	.030	1.263	.207
Agreeableness	.006 (.000; .011)	.003	.029	2.034	.042*
Conscientiousness	-.005 (-.010; .000)	.003	-.027	-1.982	.048*
Extraversion	-.002 (-.006; .003)	.002	-.010	-.735	.462
Neuroticism	.024 (.020; .028)	.002	.162	11.575	.000***
Openness	.001 (-.004; .007)	.003	.007	.507	.612
	$F(11) = 257.608$, Adjusted R^2 = .403, ꭓR^2 = .024, $p < .001$***				
Step 4					
Intercept	1.344 (.174; 2.514)	.597		2.252	
Emotional loneliness in 2019	.543 (.518; .569)	.013	.549	41.823	.000***
Age	.000 (-.002; .002)	.001	-.003	-.145	.885
Educational attainment	.002 (-0.15; .020)	.009	.003	.250	.803
Number of members in household	-.027 (-.049; -.006)	.011	-.033	-2.492	.013*
Gender	-.030 (-.123; .063)	.047	-.014	-.631	.528
Age * Gender	.037 (-.028; .103)	.033	0,004	.168	.261
Agreeableness	-.035 (-.065; -.005)	.015	-.178	-2.261	.024*
Conscientiousness	-.047 (-.078; -.016)	.016	-.236	-2.970	.003**
Extraversion	-.002 (-.006; .002)	.002	-.011	-.842	.400
Neuroticism	.024 (.020; .028)	.002	.163	11.606	.000***
Openness	.002 (-.004; .007)	.003	.008	.592	.554
Agreeableness * Conscientiousness	.001 (.000; .002)	.000	.338	2.647	.008**
	$F(12) = 237.084$, Adjusted R^2 = .404, ꭓR^2 = .001, $p = .008$**				

N = 4180. B = Unstandardized regression weight, CI = 95% Confidence Interval of unstandardized regression weight (B), SE (B) = Standard Error of unstandardized regression weight. β = Standardized regression weight. For Gender, 0 = male, 1 = female.
* $p < .05$, ** $p < .01$, *** $p < .001$

6. Conclusion

In paragraphs 6.1 and 6.2 the main findings of the analyses on social and emotional loneliness are presented. The implications of these findings for other research and theory are presented in paragraph 6.3. In paragraph 6.4 the main takeaways of the research can be found.

6.1 Main findings: social loneliness

Looking at the variance explained by the predictors the conclusion can be drawn that scores on social loneliness in the pandemic are largely predicted by the scores on social loneliness pre-pandemic ($R^2 = .426$, $p < .001$). The remainder of the model explains only another 1.9% of variance ($R^2 = .444$, $p < .001$).

The hierarchical regression shows that the changes in social loneliness between 2019 and 2020 were significantly predicted by the traits agreeableness, conscientiousness (both negative) and neuroticism (positive), confirming hypotheses for these specific traits. There was also a significant (negative) interaction between agreeableness and conscientiousness. The findings regarding extraversion do not support the hypothesis on this trait, as extraversion was significantly negatively associated with social loneliness development in the pandemic.

That these small effect sizes are being classified as significant is probably to thank to the large sample size and thus the great power of the analysis: as was mentioned earlier, the portion of variance explained by these traits is quite small. It is probable that other factors than personality could have a stronger predictive value for changes in social loneliness.

6.2 Main findings: emotional loneliness

The relationship of big five personality traits with emotional loneliness looks similar, but is slightly different than the relationship with social loneliness. In this model past scores on emotional loneliness accounted for 37.9% of variance ($R^2 = .379$, $p < .001$). The remainder of the model (with all covariates, personality traits and interactions) explained another 2.8% ($R^2 = .404$, $p < .001$).

In line with the hypotheses agreeableness and conscientiousness both were significantly negatively associated with emotional loneliness development, while neuroticism had a significant positive association. The interaction between agreeableness and conscientiousness is significantly negatively associated with emotional loneliness development.

There is no significant association between extraversion and emotional loneliness development, confirming the hypothesis for this relationship. Another significant finding is

that the size of the respondent's household is negatively associated with emotional loneliness development during the pandemic.

6.3 Findings in relation to other research and theory

It is not entirely possible to directly compare these findings to other research on loneliness in the COVID-19 pandemic. Other research compares the influence of various factors without accounting for levels of loneliness in the past, or does not split between social and emotional loneliness, while this research controls for pre-pandemic levels of experienced social and emotional loneliness.

Covariates such as age, gender and household size are usually highly significant in predicting social and emotional loneliness. Because this research largely controls for these variables through controlling for the 2019 loneliness scores (and gender, age and household size generally are not very volatile variables), these covariates cease to be significant in the model. A similar story can be told in regard to the relationship between the big five personality traits and loneliness. Personality traits are subject to change, but over a short timespan these changes are quite limited (Mund & Neyer, 2018). By controlling for the 2019 loneliness scores a lot of the effects of personality traits are controlled for, too.

While the majority of personality traits seem to stay significantly associated with loneliness, subtle differences between the two continua can be noticed. Associations of personality traits and social loneliness development seem to not have changed much in this sample. However, extraversion was remarkably not significantly associated with emotional loneliness development in 2020. These results rhyme with the research of Gubler, Makowski, Troche and Schlegel (2020) and their assessment that extraversion has ceased to significantly negatively correlate with loneliness change in the context of the pandemic.

It is possible that due to the lockdowns that had been instated at the time of data collection, extraversion could not be 'performed', and thus extraversion did not significantly predict the amount of emotional connection anymore. Interestingly this only was the case when looking at emotional loneliness. A possible explanation for this is that social loneliness is less dependent on frequent interaction than emotional loneliness. A possible corroborative factor for this explanation lies within the significant covariate: household size was significantly negatively associated with emotional loneliness development, indicating that frequency of interaction could be an important mediator.

The interaction between agreeableness and conscientiousness is worth mentioning as well: of all associations between personality and loneliness, this association had the largest

effect size for social as well as emotional loneliness development. It could be that the combination of agreeableness (being empathetic/kind) and conscientiousness (being organized) is an effective combination of qualities in preventing loneliness development in the pandemic.

6.4 Concluding statement

In this study it was found that while most of the big five personality traits remained significant predictors of loneliness development, extraversion did not appear to be significantly associated with emotional loneliness changes in the pandemic. This is important information for further research on emotional loneliness development in the pandemic.

Effect sizes of the independent variables were quite small, due to the controlling for 2019 scores of the two types of loneliness. Because of the way the data was analyzed, and the time-specificity of measurements in the pandemic, it is hard to compare effect sizes with previous research on the relationship between personality and loneliness.

Nonetheless the theoretical framework construed in this research has proven its use in exploring the divergent trajectories of social and emotional development. In future loneliness research it is important to stay cognizant of this necessity for splitting emotional and social loneliness measurements.

By adding of the various perspectives on loneliness and relevant covariates a completer model of loneliness development has been presented. With that, this research provided a way to more accurately assess the associations of these various factors in the future. This should be helpful in more effectively developing or assessing future interventions geared towards combating or preventing loneliness.

7.Discussion

In this chapter the research is discussed. In paragraph 7.1 the strengths and limitations regarding the validity of the research is assessed. In paragraph 7.2 the implications of this research for theory and practice are presented.

7.1 Strengths and limitations

Internal validity

A strong point of the framework used in this research is its interdisciplinary nature: it presents the issue of loneliness as being influenced by factors on the macro-, meso- and micro-levels.

To incorporate all these levels as well as possible interactionist (Weiss, 1973), cognitive-behavioral (Buecker, Maes, Denissen & Luhmann, 2020; Cacioppo et al, 2015) and epidemiological perspectives (Bu, Steptoe & Fancourt, 2020; Diehl, Jansen, Ischanova & Hilger-Kolb, 2018) were integrated. This integration is essential for improving understanding of loneliness development, as the pandemic has likely caused changes on all of these levels.

The IPIP and the De Jong-Gierveld short scales of loneliness are often-used, and have been validated across many age groups and nationalities (De Jong-Gierveld & van Tilburg, 2010; Donnellan, Oswald, Baird & Lucas, 2006). Combining these conceptualizations in this research has added much-needed detail to the understanding of the interaction between personality and loneliness. However, the De Jong-Gierveld short scales used in the LISS panel are quite imprecise in their measuring of the two types of loneliness: the two types of loneliness are only expressed by a score ranging from 0 to 3.

A second limitation is that the questionnaire fails to ask the respondents how often they experience these feelings. Most of us can feel lonely for a second, but it is imaginable that the experience and its consequences differ significantly when somebody feels lonely *all the time*. This essential dimension of frequency of the experience is missing from the data.

It is recommended that any further research in this direction would be realized using the longer De Jong-Gierveld scale, and that questions about the frequency and pervasiveness of feelings of loneliness are included as well.

External validity

After deleting the cases with missing values from the dataset the distribution of age in the sample appeared slightly skewed, with the 60+ age group being overrepresented. This may hold consequences for the external validity of the data. Other variables within the sample remained quite balanced, and with 4180 valid participants the representativeness of the data for the Dutch population seems to be quite good.

A major limiting factor to external validity is the time-and-place-specificity of the sample. Loneliness scores were measured in October and November of 2019 and 2020. Policies influencing the amount of possibilities and standards for social interactions changed frequently, as did adherence to these policies.

The way the data in this research was analyzed has made it hard to compare effect-sizes to other loneliness-research. This research concerned itself with *changes* in the association between personality traits and loneliness development, while general research on

the topic only concerns itself with the association itself (without controlling for previous levels of loneliness).

Ecological validity

As stated earlier, the total change of social and emotional loneliness between 2019 and 2020 in this dataset is *much* smaller than presented in research from other sources (RIVM 2020). This may be an indication of the limited ecological validity of other research: COVID-19 loneliness questionnaires could potentially have suffered from framing effects. These framing effects possibly have remained absent in this dataset due to the longitudinal nature of the LISS panel setup.

7.2 Implications

This research leads to the conclusion that there have been small but significant changes in the association between personality traits and social and emotional loneliness development during the COVID-19 pandemic. This holds some consequences for research and interventions concerning loneliness.

Many interventions focusing on reducing loneliness do not take into account the difference between social and emotional loneliness (Cacioppo et al., 2015). Furthermore, they often fail to address the cognitive processes influencing loneliness-development, instead focusing mostly on expanding opportunities for social interaction. This research shows that loneliness is a phenomenon influenced by many – sometimes interacting – factors, and it is clear that the weights of these factors differ between the two loneliness continua. In assessing the influence of covariates it was found that household size was relevant to emotional loneliness development in the pandemic, while extraversion did not reach significance. The significant association of the interaction between agreeableness and conscientiousness for both social and emotional loneliness is a new and interesting find, and provides an interesting avenue for further research.

In the LISS dataset that was used here there were no measures taken of emotion regulation strategies. Research has suggested that these strategies can play an important role in mediating the association between personality and loneliness development (Deckx, van den Akker, Buntinx & van Driel, 2018). Future research would do well to include these emotion regulation strategies in their questionnaires.

Cultural backgrounds, household income, urbanity of the household and (changes in) employment statuses were also not included as factors in this analysis. Other possibly relevant

factors in loneliness development are major life events that lead to losing a social contact (Buecker, Denissen & Luhmann, 2020). It may be that including these predictors can add significantly to models predicting loneliness development.

Due to controlling for earlier values and splitting emotional and social loneliness, it is unfortunately not possible to compare effect-sizes for the different factors in this model to other research. These results do, however, show that it is pertinent that future research on loneliness starts measuring the outcome variables of social and emotional loneliness separately.

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9. Appendices

9.1 Appendix 1: Instruments

9.1.1 Background variables: household size, age, gender

Intro: number of household members	This questionnaire contains questions about the composition of your household. It is important that you consider ALL members of your household. The following persons are considered to be members of a household: * The head of the family. * The partner of the head of the family, married or unmarried. * All children living at home. Children not or no longer living at home do not count as household members. * All other persons 'boarding' with you, meaning that they share meals with you and stay the night in your house, and so on. These could include, for example, parents or parents-in-law that live with you. These persons are considered part of the household if they normally spend at least four days a week in your home, sharing meals and staying the night, and so on. *How many members does your household consist of, including yourself? (also count persons not participating in the panel)*
Gender, birth date	*Please enter gender and birth date of every member of your household, including yourself.* Age is thereafter calculated as a derived variable.
Education level	Please indicate the educational level of the members of your household. Select the highest level that this person has already completed (with a diploma or certificate): *primary school* (1), *intermediate secondary education/vmbo* (2), *higher secondary education/havo* (3), *intermediate vocational education/mbo* (4), *higher vocational education/hbo* (5) and *university* (6).

9.1.2 Core studies: Social integration and leisure

Scores on the two types of loneliness were assessed using the De Jong-Gierveld short-scale:

To what extent do the following statements apply to you, based on how you are feeling at present?

Answer using the following categories: 1 Yes; 2 More or less; 3 No

Social loneliness	**'There are enough people I can count on in case of a misfortune.'**
	'I know a lot of people that I can fully rely on.'
	'There are enough people to whom I feel closely connected.'
Emotional loneliness	'I have a sense of emptiness around me.'
	'I miss having people around me.'
	'I often feel deserted.'

9.1.3 Core studies: Personality

Scores on personality are assembled using the IPIP-scale for Big Five personality traits. In the right column the relevant personality trait and the loading of the variable is described. Answers to negatively phrased questions are transcoded, leading to scores between 10 and 50 on each of the five personality traits.

How accurately do the statements below describe you (as a person)? Answer using the following categories: 1 very inaccurate; 2 moderately inaccurate ; 3 neither inaccurate nor accurate; 4 moderately accurate ; 5 very accurate.

I...

Am the life of the party.	(Extraversion+)
Feel little concern for others.	(Agreeableness-)
Am always prepared.	(Conscientiousness+)
Get stressed out easily.	(Reversed neuroticism-)
Have a rich vocabulary.	(Openness+)
Don't talk a lot.	(Extraversion-)
Am interested in people.	(Agreeableness+)
Leave my belongings around.	(Conscientiousness-)
Am relaxed most of the time.	(Reversed neuroticism+)
Have difficulty understanding abstract ideas.	(Openness-)

Feel comfortable around people.	(Extraversion+)
Insult people.	(Agreeableness-)
Pay attention to details.	(Conscientiousness+)
Worry about things.	(Reversed neuroticism-)
Have a vivid imagination.	(Openness+)
Keep in the background.	(Extraversion-)
Sympathize with others' feelings.	(Agreeableness+)
Make a mess of things.	(Conscientiousness-)
Seldom feel blue.	(Reversed neuroticism+)
Am not interested in abstract ideas.	(Openness-)
Start conversations.	(Extraversion+)
Am not interested in other people's problems.	(Agreeableness-)
Get chores done right away.	(Conscientiousness+)
Am easily disturbed.	(Reversed neuroticism-)
Have excellent ideas.	(Openness+)
Have little to say.	(Extraversion-)
Have a soft heart.	(Agreeableness+)
Often forget to put things back in their proper place.	(Conscientiousness-)
Get upset easily.	(Reversed neuroticism-)
Do not have a good imagination.	(Openness-)
Talk to a lot of different people at parties.	(Extraversion+)
Am not really interested in others.	(Agreeableness-)
Like order.	(Conscientiousness+)
Change my mood a lot.	(Reversed neuroticism-)
Am quick to understand things.	(Openness+)
Don't like to draw attention to myself.	(Extraversion-)
Take time out for others.	(Agreeableness+)
Shirk my duties.	(Conscientiousness-)
Have frequent mood swings.	(Reversed neuroticism-)
Use difficult words.	(Openness+)
Don't mind being the center of attention.	(Extraversion+)
Feel others' emotions.	(Agreeableness+)
Follow a schedule.	(Conscientiousness+)

Get irritated easily.	(Reversed neuroticism-)
Spend time reflecting on things.	(Openness+)
Am quiet around strangers.	(Extraversion-)
Make people feel at ease.	(Agreeableness+)
Am exact in my work.	(Conscientiousness+)
Often feel blue.	(Reversed neuroticism-)
Am full of ideas.	(Openness+)

Zero-order correlations for all variables included in the hierarchical regression

	1. DJ-G Emotional Loneliness in 2020	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
2. DJ-G Emotional Loneliness in 2019	,615**	--												
3. DJ-G Social Loneliness in 2020	,398**	,404**	--											
4. DJ-G Social Loneliness in 2019	,346**	,460**	,652**	--										
5. Age	-,084**	-,130**	0,017	0,006	--									
6. Educational attainment	-,063**	-,087**	-,068**	-,069**	-,161**	--								
7. Number of members in household	-,032*	-0,007	-0,028	-,042**	-,404**	0,028	--							
8. Gender, 0=male, 1=female	,068**	,050**	-,058**	-,058**	-,062**	-,081**	-0,012	--						
9. Age * Gender	0,016	-0,026	-,033*	-,041**	,403**	-,183**	-,183**	,738**	--					
10. IPIP Agreeableness	-,055**	-,115**	-,249**	-,267**	,071**	,064**	-,044**	,316**	,249**	--				
11. IPIP Conscientiousness	-,149**	-,161**	-,141**	-,140**	,109**	,091**	-,053**	,064**	,073**	,316**	--			
12. IPIP Extraversion	-,135**	-,170**	-,239**	-,252**	-0,008	,075**	0,017	0,017	-0,007	,317**	,129**	--		
13. IPIP Neuroticism	,378**	,384**	,261**	,255**	-,191**	-,083**	,043**	,176**	,034*	-,088**	-,282**	-,239**	--	
14. IPIP Openness	-,084**	-,101**	-,135**	-,150**	-,115**	,329**	0,009	-,063**	-,096**	,275**	,285**	,335**	-,200**	--
15. Agreeableness * Conscientiousness	-,119**	-,163**	-,234**	-,245**	,106**	,091**	-,056**	,231**	,197**	,805**	,810**	,275**	-,226**	,341**

Note: N = 4180. For Gender, 0=male, 1=female. *IPIP* International Personality Item Pool, *DJ-G* De Jong-Gierveld Loneliness Short Scale

**. Correlation is significant at the 0.01 level (2-tailed); *. Correlation is significant at the 0.05 level (2-tailed).

Load data

GET

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19_pandemic\Big5LonelinessdeletedvaluesCleanedUpInteractions.sav'.

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Descriptives

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DummyGender Num_hoho

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  /ORDER=ANALYSIS.

FREQUENCIES VARIABLES=ChangeEmo ChangeSoc Age

  /STATISTICS=RANGE MEAN

  /HISTOGRAM NORMAL

  /ORDER=ANALYSIS.

Zero-order correlations

CORRELATIONS

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DummyGender INAgeGen AGREESC

   CONSCSC EXTRASC NEURSC OPENSC INAC

  /PRINT=TWOTAIL NOSIG LOWER

  /MISSING=PAIRWISE.

Paired samples t-test on loneliness scores in 2020 and 2019:

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  /CRITERIA=CI(.9500)

  /MISSING=ANALYSIS.

Multiple regression with social loneliness 2020 as the dependent variable

REGRESSION

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/NOORIGIN

/DEPENDENT SocL2020

/METHOD=ENTER SocL2019

/METHOD=ENTER Age Edu_Atta Num_hoho DummyGender INAgeGen

/METHOD=ENTER AGREESC CONSCSC EXTRASC NEURSC OPENSC

/METHOD=STEPWISE INAC INAE INAN INAO INCE INCN INCO INEN INEO INNO

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/RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID).

Multiple regression with emotional loneliness 2020 as the dependent variable

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/CRITERIA=PIN(.05) POUT(.10)

/NOORIGIN

/DEPENDENT EmoL2020

/METHOD=ENTER EmoL2019

/METHOD=ENTER Age Edu_Atta Num_hoho DummyGender INAgeGen

/METHOD=ENTER AGREESC CONSCSC EXTRASC NEURSC OPENSC

/METHOD=STEPWISE INAC INAE INAN INAO INCE INCN INCO INEN INEO INNO

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/RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID).