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# The Influence of the COVID-19 Pandemic on Feelings of Loneliness Among Extraverted and Introverted Adolescents in the Netherlands

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### **Abstract**

The spread of the COVID-19 virus has led to lockdowns and distancing measures, which resulted in drastic changes in social interaction of adolescents. This research is aimed at studying how the lack of social contacts during the pandemic may have influenced feelings of loneliness among Dutch adolescents, with a special focus on extraverts and introverts. Data from the longitudinal 'YOUth Got Talent'-project was analyzed in this study. The sample contained 1471 male (41.3%) and female (55.7%) adolescents, aged 16 to 25 ( $M_{age}=17.85$ ,  $SD=1.95$ ), from different MBO-schools in Utrecht. As predicted, feelings of loneliness increased over time. Also, significant results were found between W1 and W3 ( $p <.001$ ), W1 and W2 ( $p <.010$ ), meaning that there were more feelings of loneliness during the COVID-19 pandemic in 2020 and 2021, than before, in 2019. These findings support the relation between increased feelings of loneliness, and distancing measures regarding the COVID-19 pandemic. However, no support was found that extraverted adolescents experienced more loneliness in response to the lockdowns than introverted adolescents. Because this study focused on loneliness and extraversion during the pandemic, further research is needed to clarify the relationship between extraversion and social isolation, since there may be a difference.

*Keywords:* adolescents; loneliness; extraversion; COVID-19; well-being; lockdown; distancing measures; mental health.

### **Abstract**

De verspreiding van het Corona-virus (COVID-19) heeft geleid tot lockdowns en een anderhalvemetersamenleving. Dit resulteerde vervolgens in drastische veranderingen in de sociale interactie van adolescenten. Dit onderzoek richt zich op het gebrek aan sociale contacten tijdens de pandemie, en hoe dit van invloed kan zijn geweest op de eenzaamheidsgevoelens van Nederlandse adolescenten. Ook wordt er gekeken naar het verschil tussen extraverte en introverte jongeren. Om dit onderzoek uit te voeren, werd de data van het longitudinale 'YOUth Got Talent'-project geanalyseerd. De steekproef bestond uit 1471 mannelijke (41.3%) en vrouwelijke (55.7%) adolescenten, in de leeftijd van 16-25 jaar ( $M_{age}=17.85, SD=1.95$ ), van verschillende MBO-scholen in Utrecht. Zoals voorspeld, namen gevoelens van eenzaamheid toe tijdens de lockdowns. Ook werden er significante resultaten gevonden tussen W1 en W3 ( $p < .001$ ), W1 en W2 ( $p < .010$ ), wat betekent dat adolescenten zich eenzamer voelde tijdens de COVID-19 pandemie in 2020 en 2021, dan daarvoor, in 2019. Er werd echter geen bewijs gevonden dat extraverte adolescenten zich eenzamer voelde tijdens de lockdowns dan introverte adolescenten. Omdat deze studie zich richtte op de gevoelens van eenzaamheid en extraversie, is verder onderzoek nodig om de relatie tussen extraversie en sociaal isolement te verduidelijken, omdat hier mogelijk een verschil tussen is.

*Keywords:* adolescenten; eenzaamheid; extraversie; COVID-19; welzijn; lockdown; anderhalvemetersamenleving; mentale gezondheid.

Since the end of 2019, the COVID-19 pandemic has been having a large impact on the world, especially for young people (Branje & Morris, 2021). The spread of the virus has led to lockdowns and distancing measures, which resulted in drastic changes in daily activities of adolescents, particularly regarding social interaction. For instance, many adolescents were not able to attend school, and therefore had to switch to online learning. Moreover, structured leisure activities were often cancelled, so adolescents had less opportunities to spend time with their peers. Chances are high this has led to an increase of loneliness during the pandemic (Branje & Morris, 2021; Cooper et al., 2021). Research has shown that almost half of the Dutch citizens between the age of 25 and 34 reported feeling lonelier during the pandemic than before (Landman, 2020). This number is even higher among those under 25, since adolescents have been found to experience high rates of loneliness (Al Omari et al., 2021).

Because of cognitive- and physiological changes during adolescence, the experience of loneliness differs from that of children and adults (Laursen & Hartl, 2013). During their development, adolescents become more autonomous and the demand for individuation leads to changes in their social relations, which makes them vulnerable to perceptions of social isolation, and therefore loneliness. Normally, a rapidly changing social world already produces more physical isolation, let alone in times of the COVID-19 pandemic. In the Dutch press conference on January 14, 2022, Minister of Health, Welfare and Sports, Ernst Kuipers stated that two out of three 16-24-year-old young people felt lonely during the lockdowns (Ouhajji, 2022).

For some, these measures had even more impact. Adolescents who are more sociable need more stimuli to feel aroused, and therefore need others to talk to (Landman, 2020; Mijumbi, 2020). Hence, adolescents who are more extraverted may have experienced more feelings of loneliness during this pandemic, compared to more introverted adolescents. Therefore, this research is aimed at studying how the pandemic influences feelings of loneliness among Dutch adolescent, with a special focus on extraverts and introverts.

### *Loneliness and social relationships*

Adolescents may feel lonely when they are alone, but also when surrounded by others (Maes et al., 2019). Therefore, the subjective experience of loneliness is not the same as the objective experience of being alone. Loneliness can be defined as “the unpleasant feeling that occurs when people distinguish their social network to be unsatisfying” (Maes et al., 2019, p.1549). While experiencing loneliness is considered to be negative because it is linked to

feelings of sadness and hopelessness (e.g., needing someone, and feeling a loss when someone is not around), the experience of being alone is not, because that feeling is often temporary (Buchholz & Catton, 1999). Although adolescents can also experience loneliness without having dissatisfying relationships, feelings of loneliness often arises when someone is not satisfied with the quantity, or, more importantly, the quality of their relationships (Maes et al., 2019). During the lockdowns, social interactions were harder to achieve, which likely had a negative impact on relationship qualities. This is problematic, since peer relations become increasingly important during adolescence, and are the most central source of individual variation in loneliness (Branje & Morris, 2021). Hence, high quality friendships are an important buffer from loneliness, and disruptions in these relationships can have serious implications (Maes et al., 2019; Mund & Neyer, 2020). Conditions like lockdowns and distancing measures must have disrupt many high-quality friendships. Therefore, it is likely to assume that loneliness will have more severe consequences since the pandemic outbreak.

#### *Extraversion versus Introversion*

Nevertheless, not every adolescent experiences same levels of loneliness, like adolescents who experience social support versus those who do not (Al Omari et al., 2021). In addition, adolescents who are more extraverted may experience the COVID-19 pandemic differently than adolescents who are more introverted. In fact, psychologist Carl Jung (1925), believed people who are high on extraversion to focus their energy outwards (e.g., towards other people), while people high on introversion are more solitary, and therefore focus their energy inwards (Jung, 1925; Mijumbi, 2020). The theory of personality by Eysenck (1967) adds to that by discussing extraversion-introversion in terms of behavioral tendencies, and underlying neurological states (Campbell & Hawley, 1982). Introverts have a lower tolerance of arousal in their brains, so they need less stimuli to feel aroused, and are easier satisfied with a minimum level of arousal than extraverts. “Thus, introverts are stimulus-shy while extraverts are stimulus-hungry” (Campbell & Hawley, 1982, p.140). At a behavioral level, Eysenck states that extraverts seek out others to interact more. Therefore, people with high levels of extraversion are expected to have a greater participation in social activities, a preference for engaging in social interactions, having greater social networks, and perceive more support from their peers (Mijumbi, 2020). They also tend to score higher on positive interpersonal outcomes like popularity and likability, and therefore are more likely to voluntarily integrate in social activities. For that reason, lockdowns and distancing measures must have had a stronger impact on adolescents who are more extraverted than adolescents

who are more introverted since they need interactions in order to have a satisfying level of arousal. In other words, extraverted adolescents need to socially connect with others to fulfill their social needs, and therefore must feel particularly lonely during this pandemic.

The theory of Weiss (1973) suggested that the level of loneliness someone experiences, depends on the satisfaction of the relationships someone has. A relationship, such as friendship, is therefore based on the relational needs someone has. Hence, it is likely to assume that extraverted and introverted adolescents both have different relational needs (DiTommaso & Spinner, 1997). As a result of the pandemic, social distancing measures may have made extraverts distressed about not being around others, while introverts were content with staying at home and not being able to socialize (Mijumbi, 2020). Despite the fact that introverted adolescents experience more loneliness, and to be socially isolated, it is expected that adolescents who are more extraverted experience more feelings of loneliness during the pandemic. Adolescents who are more extraverted need a higher level of arousal than adolescents who are more introverted, and therefore prefer engaging in social interactions.

#### *Current study*

Against the backdrop of empirical evidence on health issues caused by loneliness, and the current pandemic, this paper will examine the influence of the pandemic on loneliness, by answering the following research question: *“How does the COVID-19 pandemic influence feelings of loneliness among Dutch adolescents who are more extraverted, and adolescents who are more introverted?”* Since the pandemic is a recent event, the consequences are still visible in the lives of adolescents. Specifically, increased feelings of loneliness during this pandemic involves major risks, like the increase of (existing) mental health issues. On the one hand, social interactions become more important during adolescence, while on the other hand it is also a period where individuals experience high levels of loneliness.

However, the amount of loneliness may differ between extraverted and introverted adolescents, especially in times of a pandemic. The current study will therefore focus on the relation between loneliness and extraversion (*Figure 1*). A contribution will be made to the lack of knowledge, since this has not been studied before in the Netherlands. To accomplish this research, the following hypotheses will be tested: *During the COVID-19 pandemic, Dutch adolescents experienced more feelings of loneliness compared to the period before the pandemic (H1), and Adolescents who are more extraverted, experience a stronger increase in loneliness during the COVID-19 pandemic, compared to adolescents who are more introverted (H2).*

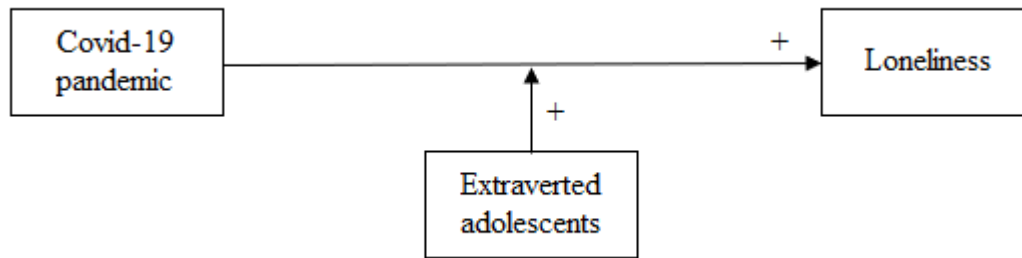


Figure 1. Research model

## Methods

### Design

In this study, data from the ‘*YOUth Got Talent*’ (YGT)-project (Inchley et al., 2017; Stevens, et al., 2018) was analyzed. The YGT-project is a longitudinal study on the SES-health gradient among young people. The project was initiated in 2016 at Utrecht University and is part of a larger study, namely the Health Behavior in School-Aged Children-study in the Netherlands (Inchley et al., 2017). This current study will also have a longitudinal design, with all three waves used from the YGT-project in 2019 until 2021. Since data on loneliness was available in all three waves, the change in feelings of loneliness was measured over time.

### Participants

The used dataset for this study was collected at several Dutch MBO-schools (vocational educational track) in the region of Utrecht. For this study, the initial sample contained 1471 male (41.3%) and female (55.7%) adolescents, aged 16 to 25 ( $M_{age}=17.85$ ,  $SD=1.95$ ), from about 73 classes within three different MBO-schools– Grafisch Lyceum Utrecht (29 classes), Nimeto Utrecht (19 classes), and ROC Midden Nederland (25 classes). These schools all cover fields of technical, creative, and health education and were all selected randomly. The final sample included 331 male (43.2%) and female (56.8%) participants ( $M_{age}=17.35$ ,  $SD= 1.36$ ,  $Min_{age}= 16.00$ ,  $Max_{age}= 24.92$ ).

### Attrition analysis

Compared to previous waves, 39.1% of the participants dropped out of the study in W3. A comparison is done between the drop-outs and participants who participated in all waves. Since the outcome variable can be a sensitive topic, it could be that the ones who are most lonely are not included in the final sample. However, an independent t-test showed no

significant differences in the mean value of participants and the ones who dropped out regarding loneliness (W1,W2) and extraversion (W1,W2). Therefore, the results of this study will also be representative for the drop-outs, since they did not score higher or lower on the used variables (*Table 1*).

**Table 1. Group Statistics Loneliness and Extraversion**

*Group Statistics<sup>b</sup>*

	Missings	N	Mean	Std. Deviation	Sig.
Loneliness scale W1	0	418	1,7962	,61604	,144
	1	463	1,8965	,65381	
Loneliness scale W2	0	420	1,8860	,63356	,355
	1	297	1,9291	,67325	
Extraversion W1	0	454	2,37	,511	,040
	1	739	2,33	,542	
Extraversion W2	0	434	2,27	,536	,700
	1	370	2,25	,551	

b. Drop-outs are 0 and participants are 1

### *Procedure*

Prior to the study, research-assistants from the YGT-project verbally explained the subject, purpose, and anonymity of the participants in front of the classroom. In addition, all students were able to give active consent, and if there were any questions, they could ask a research assistant. The researchers assured schools they would get insight information on school-level about the results of the study. No parental consent was asked for the participants who were 16 and 17 years old, because the researchers considered them capable of making independent decisions regarding (mental) healthcare. However, parents of students from the selected classes were informed about the aims of the study, and adolescents were always able to drop out of the study. During the study, participants completed a 60-minute computer-based questionnaire at school during their regular hours, while being watched by research assistants. In contrast to individual participants, schools received a reward when they participated in the study. For the reason that the YGT-project is an ongoing yearly study, results were stored anonymously at the Trimbos-institute database. This database contains a personal school-and class number, created for this specific study. Because the data was collected anonymously, it was no longer traceable to individual persons. Lastly, this study



procedures were approved by the board of ethics of the Faculty of Social Sciences at Utrecht University (FETC18-070) in 2018.

### *Measurements*

The used questionnaire consists of 92 items with answer possibilities on the Likert scale, and multiple-choice questions. To analyze this data, IBM SPSS Statistics 27 will be used.

### *Loneliness*

The dependent variable in the current study is loneliness and was measured by a five-point scale of the UCLA Loneliness Scale (Russel et al., 1980), with 1 meaning ‘completely disagree’ and 5 meaning ‘completely agree’. Sample items measuring loneliness can be “I feel lonely”, “I don’t have any real friends” and “Even when I am in company, I feel lonely.” To check the reliability of the loneliness-scale as it was conducted in the existing dataset, a reliability analysis was done for W1 ( $\alpha = .888$ ), W2 ( $\alpha = .894$ ), W3 ( $\alpha = .890$ ), and W123 ( $\alpha = .878$ ).

### *Time*

The independent variable of this study is time. More specifically, this research is about how loneliness develops over time during the COVID-19 pandemic in the Netherlands. Time will be measured on the basis of the different waves.

### *Extraversion*

Lastly, a three-point scale on the Strengths and Difficulties Questionnaire (Goodman, 1997) was used to measure extraversion, with 1 meaning ‘not true’ and 3 meaning ‘definitely true’. The item that was used to measure extraversion was “I easily share with others.” The question to measure introversion was “I am rather self-contained. I usually play alone or don’t interfere with others.” After recoding, these two items were computed into the final moderator variable.

### *Data Analysis*

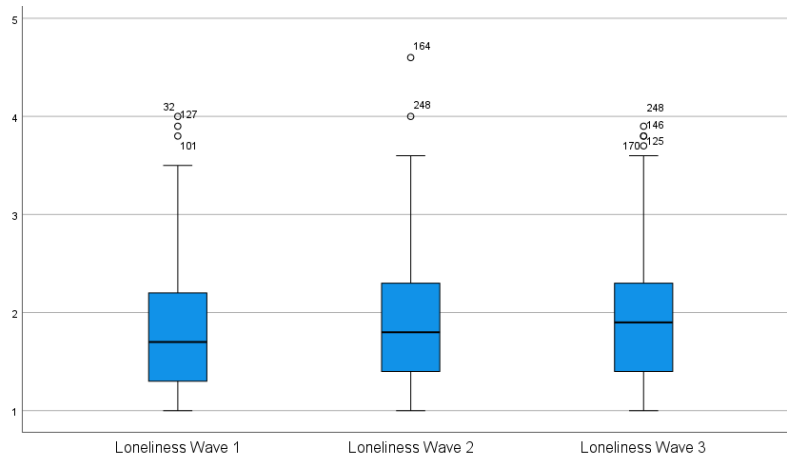
To examine whether feelings of loneliness changed over time during the COVID-19 pandemic, a repeated measures ANOVA will be conducted with loneliness as the independent variable ( $M = 1.86$ ,  $SD = 0.63$ ), time as the dependent variable, and extraversion as a moderator ( $M = 2.32$ ,  $SD = 0.47$ ). Loneliness and extraversion will be assessed from W1, W2,

and W3. As for the COVID-19 pandemic, it will be measured over time. So, before the pandemic outbreak in W1 (2019) and during the pandemic in W2 (2020) and W3 (2021).

As a preparation for the entire analysis, the data will be cleaned. That is to say, waves (1,2,3,12,13, 23) and variables (e.g., substance use, SES, and migration background) that will not be used in this study were removed from the YGT dataset. In addition, 1140 students were excluded because they either did not participate in all three waves or did not answer one or more questions about loneliness or extraversion.

In addition, important assumptions were tested. Outliers were found on the loneliness scale, meaning that there were respondents who scored high on loneliness (*Figure 2*). Although there were outliers, there was no theoretical reason to exclude these cases. They just scored high but did not give any other unpalusible answers on the questionnaire.

Furthermore, ANOVA assumes that the variances of the population sample are equal. The boxplot also showed that the variances for loneliness in W1 and W2 were equal (*Figure 2*). However, it was noticed the variance in W3 was larger compared to both W1 and W2, since the horizontal line was a bit higher.



*Figure 2. Boxplot with outliers and Equal Variance of the Loneliness scale.*

To test normality, the histogram showed there was no normal distribution on loneliness (*Figure 3*). Since ANOVA analyses are rather robust, and the distribution here is not extremely skewed, it is not considered to be a big issue the assumption was not met. However, Log transformation was performed in an attempt to restore the normality. Results converged for log-transformed values and initial values did not change the results of the ANOVA analysis.

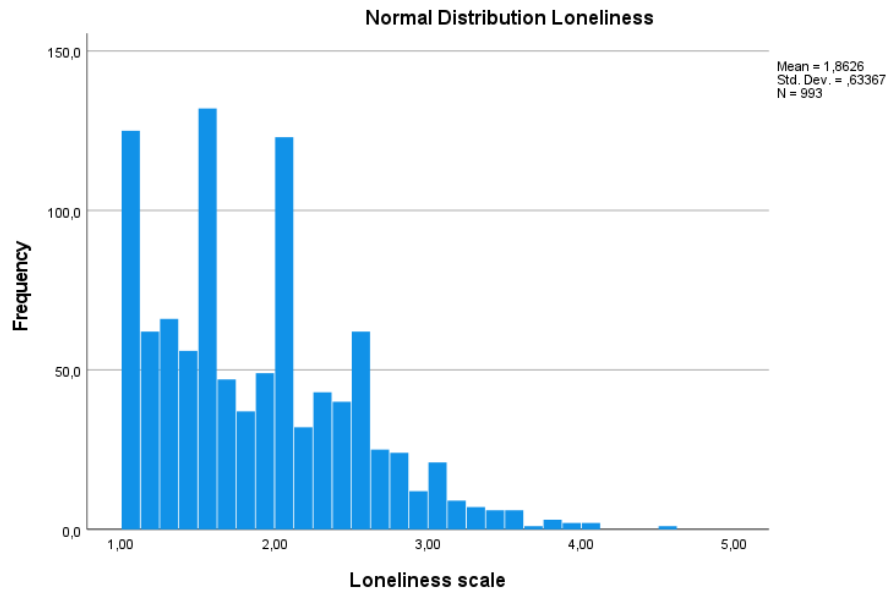


Figure 3. Histogram with no normal distribution for all three the waves.

## Results

The observed means of the loneliness-scale varied over time (*Table 2*). The loneliness measures of W3 ( $M = 1.92$ ,  $SD = 0.64$ ) tended to be the highest of all waves and the measures of W1 ( $M = 1.79$ ,  $SD = 0.63$ ) the lowest. So, in 2021, adolescents felt lonelier than in 2019 and 2020.

**Table 2. Descriptive Statistics Loneliness scale**

### *Descriptive Statistics*

	Mean	Std. Deviation	N
Loneliness Wave 1	1,7912	,62838	331
Loneliness Wave 2	1,8716	,63182	331
Loneliness Wave 3	1,9248	,63553	331

### *Hypothesis testing*

The first hypothesis that was tested was: *During the COVID-19 pandemic, Dutch adolescents experienced more feelings of loneliness compared to the period before the pandemic.* As predicted, *Figure 4* shows that feelings of loneliness became significantly higher over time ( $F(2) = 12.774$ ,  $p < .001$ )<sup>1</sup>.

<sup>1</sup> An alpha of 0.05 was used as a significance level for the analyses of both hypotheses.

*Tests of Within-Subjects Effects*

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Time	Sphericity Assumed	2,994	2	1,497	12,774	,000	,037	25,547	,997
	Greenhouse-Geisser	2,994	1,834	1,632	12,774	,000	,037	23,431	,995
	Huynh-Feldt	2,994	1,844	1,624	12,774	,000	,037	23,556	,995
	Lower-bound	2,994	1,000	2,994	12,774	,000	,037	12,774	,946
Error(Time)	Sphericity Assumed	77,359	660	,117					
	Greenhouse-Geisser	77,359	605,337	,128					
	Huynh-Feldt	77,359	608,555	,127					
	Lower-bound	77,359	330,000	,234					

a. Computed using alpha = ,05

*Figure 4. Within-Subjects Effects: increased Loneliness over Time*

The repeated-measures ANOVA determined that scores on the loneliness-scale differed significantly across three time points. Although it is now known that the differences between means of the three waves are large enough to reach significance, it is still not known between which of the various pairs of means the difference was significant. Therefore, a pairwise comparison was done to examine the differences between W1 and W3 ( $p < .001$ ), W1 and W2 ( $p < .010$ ), and W2 and W3 ( $p < .057$ ). In addition, a post hoc pairwise comparison using the Bonferroni correction showed significant results on the level of loneliness between the years 2019 and 2020, along with 2019 and 2021. However, for the year 2020 and 2021, the results were not statistically significant.

**Table 3. Post-Hoc Loneliness per wave**

*Pairwise Comparisons*

Measure: MEASURE\_1

(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig. <sup>b</sup>	95% Confidence Interval for Difference <sup>b</sup>	
					Lower Bound	Upper Bound
1	2	-,080*	,027	,010	-,146	-,015
	3	-,134*	,030	,000	-,205	-,062
2	1	,080*	,027	,010	,015	,146
	3	-,053	,023	,057	-,108	,001
3	1	,134*	,030	,000	,062	,205
	2	,053	,023	,057	-,001	,108

Based on estimated marginal means

\*. The mean difference is significant at the ,05 level.

b. Adjustment for multiple comparisons: Bonferroni.

The second hypothesis that has been examined was: *Adolescents who are more extraverted, experience a stronger increase in loneliness during the COVID-19 pandemic, compared to adolescents who are more introverted.* Again, a repeated measures ANOVA was utilized to find out whether there were any differences in loneliness among more extraverted and more introverted adolescents. In this hypothesis, the independent variable is the COVID-19 pandemic (measured in time), the dependent variable is loneliness, and extraversion is used as a moderator. Contrary to this hypothesis, no significant group differences were found between extraversion and introversion ( $F(28) = .814, p > .737$ ), in the development of loneliness during social distancing measures.

*Tests of Within-Subjects Effects*

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Time	Sphericity Assumed	,475	2	,238	2,075	,127	,013	4,150	,425
	Greenhouse-Geisser	,475	1,790	,265	2,075	,133	,013	3,714	,401
	Huynh-Feldt	,475	1,973	,241	2,075	,128	,013	4,094	,422
	Lower-bound	,475	1,000	,475	2,075	,152	,013	2,075	,299
Time * Extraversion	Sphericity Assumed	2,611	28	,093	,814	,737	,069	22,805	,738
	Greenhouse-Geisser	2,611	25,059	,104	,814	,723	,069	20,410	,699
	Huynh-Feldt	2,611	27,622	,095	,814	,735	,069	22,497	,733
	Lower-bound	2,611	14,000	,186	,814	,653	,069	11,403	,502
Error(Time)	Sphericity Assumed	35,488	310	,114					
	Greenhouse-Geisser	35,488	277,435	,128					
	Huynh-Feldt	35,488	305,815	,116					
	Lower-bound	35,488	155,000	,229					

a. Computed using alpha = ,05

*Figure 6. Moderator Effect: Time \* Extraversion.*

## Discussion

The aim of this study was to examine whether feelings of loneliness increased among adolescents during the COVID-19 pandemic. As predicted, adolescents felt lonelier during the pandemic, than before. However, no group differences were found between adolescents who are more extraverted and adolescents who are more introverted.

Consistent with previous findings (e.g., Al Omari et al., 2021; Branje & Morris, 2021; Cooper et al., 2021; Mijumbi, 2020), the COVID-19 pandemic seemed to have a negative influence on the feelings of loneliness among adolescents. In the current study, adolescents reported the highest increase in feelings of loneliness between W1 in 2019 and W3 in 2021. In line with H1, these findings support the expectations of increased feelings of loneliness due to lockdowns and distancing measures (Branje & Morris, 2021; Cooper et al., 2021). Given that

there were less opportunities to spend time with their peers, because of online learning and leisure activities being cancelled, adolescents had considerably less social interaction. As a consequence, the most plausible way to explain the results of H1 is by social isolation. This indicates that the COVID-19 pandemic, and all its distancing measures, predicts higher feelings of loneliness among adolescents.

As mentioned, increased feelings of loneliness during the pandemic involves the risk of increased (existing) mental health issues as well (Ouhajji, 2022). The article by Branje & Morris (2021) indicated that adolescents who were already more at risk to feel lonely before the pandemic, because of their individual characteristics, experienced even more mental health issues. Therefore, in line with these study, it is expected that the pandemic not only predicts increased feelings of loneliness, but also predicts the increase of (existing) mental health issues among adolescents.

Since extraverts are more sociable, and therefore need more stimuli to feel aroused and others to talk to, adolescents who are more extraverted may need a greater participation in social activities, and a higher preference for engaging in social interactions, compared to adolescents who are more introvert (Mijumbi, 2020). For that reason, and in line with the theory of personality by Eysenck (1967), it was expected that more extraverted adolescents were more likely to feel lonely during the pandemic. Nevertheless, no evidence was found to support the second hypothesis. In line with these findings is the following statement: “It is possible that COVID-19 has thrown everyone into recurring confrontations with feelings of loneliness and reminders of one’s socially isolated state (Mijumbi, 2020, p.119).” In other words, there was no moderating effect of extraversion on the feelings of loneliness during the pandemic.

From a theoretical perspective, it may be possible that adolescents who are more extraverted found other ways to interact with others, for example by calls, video-chats, texts, and social media. A more methodological explanation could be that two questions about extraversion were not sufficient. Therefore, it is debatable whether the questionnaire accurately measures extraversion (*construct validity*). One of these questions, “I easily share with others”, might have been double interpreted by the participants, causing different results (e.g., ‘sharing’ can also mean sharing your thoughts/ideas by talking to others, or sharing your food/toys with others). Moreover, just because someone shares easily, that would not necessarily assess that they also need to share in order to feel good. All in all, it is possible that the questionnaire did not measure all aspects of this concept.

### **Limitations and further directions**

Several limitations and strengths of the current study should be noted. To begin with, the initial sample size consisted of a larger group of respondents. However, some of the students did not fill in the questions regarding loneliness or extraversion, which resulted in a smaller sample size. Although loneliness is a sensitive topic, drop-outs did not score higher or lower on the loneliness-scale in W3, compared to the previous waves, so this study will still be representative. Yet, this is something to keep in mind, when conducting a similar research about sensitive topics. It is also noteworthy that the study design is longitudinal, so it has followed the same individuals overtime. For this reason, changes over time have been established, as well as the reason why it has changed. Still, there could have also been other confounding reasons why loneliness changed over time.

Nothing is known yet about the long-term effects on loneliness since the pandemic is not entirely over. Additionally, because the pandemic is something adolescents have never experienced before, it is of great value to keep track on their development and well-being. Future studies should focus on adolescents who were already vulnerable for mental health issues due to the results of the current study. Moreover, a lot of research is done on the relationship between extraversion and loneliness, but not much research has been done on extraversion and social isolation. Therefore, the current study may be used as a framework to raise awareness, and thereby develop or support youth policy, and to suggest to schools and mental health care organizations to develop or engage educational interventions about the influence of the pandemic on feelings of loneliness among adolescents.

### **Conclusion**

Findings of this study showed that feelings of loneliness increased over time between 2019 and 2020, and between 2019 and 2021. Because similar results were found within other studies (e.g., Branje & Morris, 2021; Cooper et al., 2021), increased loneliness among adolescents during the COVID-19 pandemic may be seen as an international trend. Although this was expected, no differences were found between introverts and extroverts in this study. However, this is not to say that these do not exist. Therefore, instead of focusing on loneliness and extraversion, future research should investigate the relationship between extraversion and social isolation, since there may be a difference. However, due to the impact on their (mental) well-being, it is important to keep an eye on all adolescents who have experienced social isolation because of lockdowns and distancing measures. Especially in a rapidly changing (social) world like this.

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