



**Examining Changes in Substance Use of Dutch Adolescents Before and During the
COVID-19 Pandemic:
Gender, Family Affluence and Corona Worries as Moderators**

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Abstract

Recent studies have shown that the consequences of the COVID-19 crisis may lead to an increase in psychological symptoms and disorders such as anxiety, depression, worry, and stress. However, it remains to be seen what the potential consequences of COVID-19 are for adolescent substance use. The aim of this study was to investigate the change in substance use before and during the COVID-19 crisis of Dutch adolescents and whether this change was moderated by gender, family affluence and corona worries. Data from the Dutch YOUth Got Talent project collected in 2019/2020 were used. The sample included 462 adolescents between 16 and 25 years old ($M = 17$, $SD = 1.4$). The results of the McNemar Test showed no significant change in smoking, alcohol and cannabis use during the COVID-19 crisis compared to before the COVID-19 crisis. The repeated measures ANOVA showed an increase in substance use during COVID-19 compared to before COVID-19, when analyzing all substances together. The difference in substance use before and during COVID-19 did not vary across gender, family affluence and corona worries. Practical implications are further discussed.

Keywords: COVID-19, substance use, adolescents, gender, family affluence, corona worries

Samenvatting

Recente onderzoeken hebben aangetoond dat de gevolgen van de COVID-19-crisis kunnen leiden tot een toename van psychische symptomen en stoornissen zoals angst, depressie, piekeren en stress. Het valt echter nog te bezien wat de mogelijke gevolgen van COVID-19 zullen zijn voor het middelengebruik van adolescenten. Het doel van deze studie was om de verandering in middelengebruik voor en tijdens de COVID-19-crisis van Nederlandse adolescenten tussen de 16 en 25 jaar te onderzoeken en of deze verandering werd gemodereerd door geslacht, gezinswelvaart en coronazorgen. Data van het Nederlandse YOUth Got Talent-project verzameld in 2019/2020 zijn gebruikt. De steekproef bestond uit 462 adolescenten in de leeftijd 16 tot 25 jaar oud ($M = 17$, $SD = 1.4$). De resultaten van de McNemar Test lieten geen significante verandering zien in roken, alcohol- en cannabisgebruik tijdens COVID-19 in vergelijking met vóór COVID-19. De herhaalde metingen van ANOVA toonden een stijging in middelengebruik tijdens COVID-19 in vergelijking met vóór COVID-19, wanneer alle middelen samen zijn geanalyseerd. Het verschil in middelengebruik voor en tijdens COVID-19 varieerde niet in geslacht, gezinswelvaart en coronazorgen. Praktische implicaties worden verder besproken.

Sleutelwoorden: COVID-19, middelengebruik, adolescenten, gender, gezinswelvaart, coronazorgen

Examining Changes in Substance Use of Dutch Adolescents Before and During the COVID-19 Pandemic: Gender, Family Affluence and Corona Worries as Moderators

The world is currently dealing with the COVID-19 pandemic. The outbreak of the 2019 novel coronavirus has had a devastating global impact. In June 2021, the World Health Organization (2021) published that worldwide 174 million people were infected, and over 3.7 million people died since the beginning of the pandemic. In order to reduce the spread of the virus, several measures have been taken, such as strict social distancing in many geographic regions and the closure of schools (Dumas et al., 2020). The consequences of the COVID-19 crisis may lead to an increase in psychological symptoms and disorders such as anxiety, depression, worry, and stress (Rogers et al., 2020). However, it remains to be seen what the potential consequence of COVID-19 will be for adolescent substance use. On the one hand, COVID-19 measures like quarantine and social distancing ensure that both public and private gatherings are restricted, which can reduce adolescent substance use since adolescents often use substances when surrounded by others (Branstetter et al., 2011; Jacka et al., 2020). On the other hand, substances can be used as a coping mechanism in stressful times (Kuntsche et al., 2005) and as such, substance use among adolescents may have increased during times of COVID-19.

Focusing on substance use is relevant because of its mental and physical health consequences, and it is typically initiated during adolescence (Monahan et al., 2014). Besides, substance use in adolescence has adverse effects later in life, as it predicts substance dependence in adulthood (Bonomo et al., 2004). Adolescent substance use, which encompasses the use of alcohol, tobacco, marijuana, and more illicit drugs, is relatively common (Trucco, 2020). Is adolescents' substance use influenced during times of crisis? To examine this, this study aims to investigate how adolescents' substance use has changed during the COVID-19 crisis compared to before the COVID-19 crisis.

A Decrease in Substance Use Due to COVID-19

There is reason to expect that the measures to reduce the spread of the COVID-19 virus lead to a decrease in adolescent substance use. Because in general, changes in social context during adolescence can have a negative effect on substance use (Branstetter et al., 2011). During this developmental period, the social influence changes, such as the increasing influence of peers, whilst family members get less important (Telzer et al., 2018). According to Branstetter et al. (2011), adolescents primarily engage in substance use with their peers. Substance use happens mostly in interaction with peers because of the combination of selection and socialization. Adolescents often chose friends who already display similar

behaviors, for example, engaging in substance use (Tsakpinoglou, & Poulin, 2017). Socialization occurs when adolescents adapt their attitudes, beliefs and behavior to conform to their peers (Simons-Morton, 2007). Adolescents susceptible to peer influence or peer pressure are therefore more likely to use substances (Schuler et al., 2019).

The previous assumes that the amount of engagement in substance use can be influenced by reducing face-to-face interactions with other adolescents (Branstetter et al., 2011). Social distancing was needed to reduce the spread of the COVID-19 virus (Dumas et al., 2020). The restrictions from the Dutch government were meant to prevent people from visiting each other. Adolescents were advised to limit contact with their peers, and schools were closed. Indeed, a decrease in face-to-face peer contact in the evening has been found to decrease adolescent substance use (De Looze et al., 2019). Therefore, substance use may be limited during the pandemic since most adolescents consume substances with their peers and are less likely to do this alone (Branstetter et al., 2011).

An Increase in Substance Use Due to COVID-19

Dealing with the COVID-19 crisis has an impact on adolescents' daily lives and can cause stress that adolescents have about their future (Ponnet et al., 2020), which can lead to an increase in adolescent substance use. Motives for adolescents to use substances could be to cope with difficult circumstances (Kuntsche et al., 2005). The Stress-coping Model is a cognitive-behavioral theory that states that a coping response to stress can function to increase positive affect or reduce negative affect (Hassanbeigi et al., 2013). Stress refers to the problems or strains people experience during their life and coping refers to the cognitive or behavioral responses to deal with this stress. Adolescents that perceive stress or strain may use substances as a coping mechanism to reduce this stress (Abbey et al., 1993).

Therefore, substance use may have increased because of the stress adolescents experience due to the pandemic. This is in line with earlier research suggesting that substance use, used as coping mechanism, increases after a disaster due to increased psychological distress (Rogers et al., 2020). If adolescents experience the pandemic as a disaster, they may be more likely to use substances to cope with the COVID-19 crisis.

Differences in Substance Use Before and During COVID-19, Moderated by Gender, Family Affluence and Corona Worries

There are differences in the use of substances regarding gender. Boys use more psychoactive drugs than girls, including alcohol, tobacco, marijuana and cocaine (Kuhn, 2015). An explanation for this gender difference is that boys are more likely to drink to combat stress (Nolen-Hoeksema & Harrell, 2002). As mentioned earlier, adolescents can

experience stress during the COVID-19 crisis (Rogers et al., 2020). Since boys are more likely to drink to combat stress than girls, they may be more prone to use substances during the pandemic, and therefore the difference in substance use before and during COVID-19 may be more substantial for boys than girls.

Regarding family affluence, adolescents with lower family affluence may be more prone to substance use during the COVID-19 crisis because adolescent substance use is generally correlated with a lower socioeconomic status (SES) of the family (Bachman et al., 2011). Childhood social disadvantages are linked with later use of psychoactive drugs, especially cannabis (Daniel et al., 2009). This can be explained by the Strain Theory of Merton (1968), which states that when individuals do not have the resources to reach their goals, they can experience “strain”. Adolescents from a lower SES family can experience this strain and use substances to cope with these negative emotions of not reaching their goals (Merton, 1968). Additionally, families with a lower SES are more likely to have unstable incomes and work conditions; these conditions can be worsened by the COVID-19 crisis (Patel et al., 2020). This financial insecurity can have a negative impact on the mental health of people with a lower SES, which can cause stress. Adolescents that experience this stress in the family can use substances as a form to cope (Kuntsche et al., 2005). Adolescents with lower family affluence may be extra vulnerable to the strain they experience due to the COVID-19 crisis, and therefore the difference in substance use may be more substantial for them than adolescents with higher family affluence.

Another reason for adolescents to be more prone to substance use during COVID-19 is that they worry about an entirely new phenomenon: being infected by corona or infect other people. These worries can have a negative effect on the mental health of adolescents (Dumas et al., 2020), and substances can be used as a coping mechanism (Kuntsche et al., 2005). Therefore, the difference in substance use before and during COVID-19 may be more substantial for adolescents with many corona worries than adolescents with fewer corona worries.

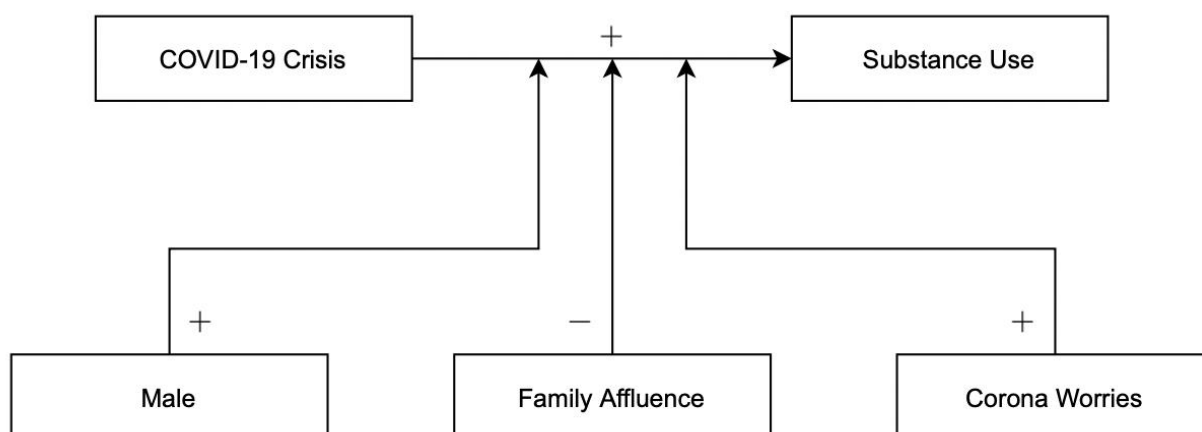
Current Study

Using the YOUth Got Talent data, the research question “*To what extent is there a change in substance use of Dutch adolescents between 16 and 25 between fall 2019 (before COVID) and fall 2020 (during COVID)?*” will be investigated. Measures of tobacco, alcohol and cannabis use will be included in this study to assess substance use. Additionally, it will be examined to what extent the difference in substance use before and during COVID-19 varies across gender, family affluence and corona worries. Based on the literature, either

increases or decreases in substance use between fall 2019 and fall 2020 can be expected. The following hypotheses are formulated: H1: Adolescent substance use has increased during COVID-19 in comparison with before COVID-19, or adolescent substance use has decreased during COVID-19 in comparison with before COVID-19. H2: The difference in substance use before and during COVID-19 is more substantial for boys than for girls. H3: The difference in substance use before and during COVID-19 is more substantial for adolescents with lower family affluence than for adolescents with higher family affluence. H4: The difference in substance use before and during COVID-19 is more substantial for adolescents who experience many corona worries than for adolescents with fewer corona worries.

Figure 1

Change in Substance Use of Dutch Adolescents Before and During COVID-19 and the Moderators Gender, Family Affluence and Corona Worries



Method

Sample

In this study, data from the YOUth Got Talent project were used. The YOUth Got Talent project is a longitudinal survey study among first-year MBO students in the Utrecht region of the Netherlands, assessing their wellbeing, health and social relations. Three MBO schools agreed to participate: Nimeto Utrecht (Nimeto), Grafisch Lyceum Utrecht (GLU), and ROC Midden Nederlands (ROC MN). Within these schools, 73 classes were selected for participation in the study. Participants completed a questionnaire on three occasions. The first questionnaire was completed in autumn 2019/winter 2020 (T1, n = 1,231) and the last one in autumn 2020/winter 2021 (T3, n = 576).

In each classroom, a trained researcher administered a questionnaire (due to the COVID-19 virus, the questionnaire at T3 was administered online). The self-reported questionnaires were administered in an (online) classroom setting and took roughly 20-30 minutes. Participants gave active consent and were informed that their data would be anonymized. Ethical approval was gained from the Ethics Assessment Committee of the Faculty of Social Sciences at Utrecht University in 2018.

Because of the COVID-19 pandemic and education being mostly online in spring 2020, there was substantial attrition, with only about a quarter of the adolescents (386) participating at all three time points. For this study, data from Fall 2019 (T1) and Fall 2020 (T3) were used, which consisted of 462 adolescents between the age of 16 and 24. The mean age of adolescents at T1 was 17 years old ($SD = 1.4$). Across the sample, 56.3% were girls, and 43.7% were boys. Concerning educational level, 90% followed an MBO level 4 track, 5.6% followed MBO level 3 track, 3.2% MBO level 2 and 1.1% MBO level 1. Regarding the migration background, 82.7% has a Dutch background, 10.8% non-western, and 6.3% has a background from other western countries.

Instruments

Substance Use: Substance use before (T1) and during COVID-19 (T3) was measured using the variables alcohol, cannabis and smoking. For all three substances, the question “On how many days did you use the substance in the last four weeks?” was assessed. Participants could answer this question with the following answer options: 1= Never, 2= 1 or 2 days, 3= 3-5 days, 4= 6-9 days, 5= 10-19 days, 6= 20-29 days, 7= 30 days or more. Self-reports of adolescent drinking seem reasonably reliable and valid on a population and individual level (Lintonen, 2004). These variables were made dichotomous, with 0 = Never and 1 = Ever. To measure the main effect and the effect of the moderators, a new continue variable is constructed with a sum score of all substance use variables of T1 and a new variable with a sum score of all substance use of T3.

Gender: Gender was assessed using a single item, measuring sex (0=girl, 1=boy).

Family Affluence: To measure family affluence, the Family Affluence Scale (FAS) was assessed. Participants were asked to answer the following questions: Does your family have a car (or a van)? Do you have your own bedroom (just for you)? How many computers does your family have (laptops, iPads, and tablets do count, smartphones, game consoles do not count)? How many bathrooms (with a shower or a bath) does your house have? Do you have a dishwasher at home? How often have you been on holiday with your family outside the Netherlands in the last 12 months? (a short or long vacation). These items are measured

on a 13-point scale, with a higher score indicating more material assets of the family. For this study, this scale was transformed into low FAS (0-7), medium FAS (8-9) and high FAS (10-13). The FAS is a reliable and valid instrument that can measure family affluence through adolescent reports (Torsheim et al., 2016).

Corona Worries: Corona worries were measured with three self-developed items on a 5-point Likert scale with the answer options: 1= Strongly disagree, 2= Disagree, 3= Neither agree nor disagree, 4= Agree, 5= Strongly agree. The participants were asked to answer the following statements: I am afraid that my family will be infected with the coronavirus; I am afraid to be infected with the coronavirus; due to the corona crisis, I am afraid to be around other people. This scale was transformed into little corona worries (0-1.66), medium corona (1.67-3.33) worries and many corona worries (3.34-5) (Cronbach's $\alpha = .77$).

Age: For the control variable age, a single item was used, measuring the age in years of the participants at T1.

Data Analysis

The statistical computer program SPSS statistics 27 was used to answer the research questions. Prior to running the analyses, initial data checks were done. First, a frequency table of all variables was assessed to analyze the data and screen the data for errors. Histograms were made to check for normally distributed residues. Data from the frequency tables were used to describe the descriptive statistics. A correlation matrix with the study variables was conducted to inspect associations between the dependent and independent variables and the control variable.

A McNemar Test was used to measure the difference in adolescent substance use before (T1) and during COVID-19 (T3). These analyses were also performed when distinguishing between boys/girls, low/medium/high family affluence and adolescents with little/medium/many corona worries.

To further investigate the research questions, a repeated measures ANOVA was performed. This examined the main effect of time and the moderation effect with the moderators gender, family affluence and corona worries. In order to do so, it was checked whether the assumptions of normal distribution and sphericity had been met. Shapiro-Wilk statistics indicated that the assumption of normality was not supported ($p < .05$). Mauchly's test of sphericity was significant ($p < .05$), which means that the assumption of sphericity is violated. This means that the F-ratios have to be interpreted cautiously as the Type I error rate can increase. To reduce the Type I error, SPSS has generated the Huynh-Feldt correction that alters the degrees of freedom, which is used for this analysis. The sum score of substance use

before COVID-19 and the sum score of substance use during COVID-19 formed the variable time. The variables gender, family affluence and corona worries are included as main and interaction effects with time. Also, the control variable age was included in the analyses as a covariate.

Results

Descriptive Statistics

The descriptive statistics show that the sample consists of 6.9% adolescents with low family affluence, 55.4% with medium family affluence and 36.8% with high family affluence. 12.1% of the adolescents have little worries about corona, 71.0% have a medium level of worries about corona, and 15.4% of the adolescents have many corona worries.

A correlation analysis was conducted to test the associations between the control variable age, moderator's gender, family affluence and corona worries and the dependent variable, the sum score of substance use before and during COVID-19. As shown in Table 1, a higher level of adolescent substance use before COVID-19 is significantly related to an older age, higher family affluence and more substance use during COVID-19. Substance use during COVID-19 is significantly correlated to older age and more substance use before COVID-19.

Table 1

Correlation Matrix of the Variables Age, Gender, Family Affluence, Corona Worries, Substance Use Before COVID-19 and During COVID-19

	1	2	3	4	5	6
1. Age	-	-	-	-	-	-
2. Gender	.046	-	-	-	-	-
3. Family Affluence	-0.84	.076	-	-	-	-
4. Corona Worries	.147*	-.197*	-.179*	-	-	-
5. Substance Use Before COVID-19	.137*	.051	.055	.083	-	-
6. Substance Use During COVID-19	.084	.059	.071	.023	.628*	-

Note. Spearman correlation was used for ordinal and continuous variables.

Pearson correlation was used for dichotomous variables. * $p < .01$.

Change in Substance Use Due to COVID-19

To test the difference in substance use before COVID-19 and during COVID-19, a McNemar Test was conducted. As shown in Table 2, the results showed no significant difference in smoking, alcohol and cannabis use before and during COVID-19. Furthermore, these differences were studied, distinguishing between boys/girls, low/medium/high family affluence and adolescents with little/medium/many corona worries. The results showed for almost all variables no significant effect, except for cannabis use for adolescents with little corona worries. For these adolescents, cannabis use has significantly increased during COVID-19 ($1, N = 41$) = $p < .004$. For some analyses, SPSS could not generate the Chi-Square, which is indicated by a hyphen in Table 2.

Table 2

McNemar Test of Substance Use Before COVID-19 and During COVID-19 for the Total Groups as Across Subgroups

	Before COVID-19	During COVID-19	N	Chi- Square	<i>p</i>
Smoking	17.31%	19.47%	416	1.362	.243
Alcohol	57.11%	60.19%	422	1.485	.223
Cannabis	11.90%	14.76%	420	2.017	.156
Gender					
Smoking Girl	16.31%	19.31%	233	-	.210
Smoking Boy	18.58%	19.67%	183	-	.839
Alcohol Use Girl	55.88%	60.50%	238	1.887	.170
Alcohol Use Boy	58.70%	59.78%	184	.023	.880
Cannabis Use Girl	8.90%	10.59%	236	-	.523
Cannabis Use Boy	15.76%	20.11%	184	1.29	.256
Family Affluence					
Smoking Low Family Affluence	23.08%	23.08%	26	-	1.000
Smoking Medium Family Affluence	16.46%	21.10%	237	3.448	.063
Smoking High Family Affluence	17.76%	16.45%	152	-	.791
Alcohol Use Low Family Affluence	30.77%	42.31%	26	-	.250

Alcohol Use Medium Family Affluence	55.37%	57.02%	242	.167	.683
Alcohol Use High Family Affluence	64.71%	67.97%	153	.410	.522
Cannabis Use Low Family Affluence	18.52%	11.11%	27	-	.625
Cannabis Use Medium Family Affluence	12.08%	15.00%	240	1.029	.310
Cannabis Use High Family Affluence	10.53%	15.13%	152	-	.189
Corona Worries					
Smoking Little Corona Worries	7.69%	13.46%	52	-	.375
Smoking Medium Corona Worries	17.94%	20.27%	301	1.161	.281
Smoking Many Corona Worries	22.58%	20.97%	62	-	1.000
Alcohol Use Little Corona Worries	52.94%	64.71%	51	-	.180
Alcohol Use Medium Corona Worries	59.28%	60.59%	307	.122	.727
Alcohol Use Many Corona Worries	49.21%	53.97%	63	-	.508
Cannabis Use Little Corona Worries	3.92%	21.57%	51	-	.004*
Cannabis Use Medium Corona Worries	12.13%	13.77%	305	.356	.551
Cannabis Use Many Corona Worries	17.46%	14.29%	63	-	.687

Note. * $p < .05$.

Gender, Family Affluence and Corona Worries as Moderators

Repeated measures ANOVAs were performed to analyze the change in substance use during COVID-19 compared to before COVID-19 and to determine whether gender, family affluence, and corona worries moderated this change. As shown in Table 3, the ANOVA displays that substance use before COVID-19 differs positively significant from substance use during COVID-19 $F(1, 388) = 5.45, p = .020$. This means that adolescent substance use was higher during COVID-19 than before COVID-19, when controlling for age. Regarding the repeated measures ANOVA estimates, the mean score for substance use before COVID-19 is 4.6 and during COVID-19 4.7, implying only a small increase. Moreover, the results show that the control variable age is positively significant, indicating that there is a significant difference between age groups regarding the change in substance use before and during COVID-19. Gender, family affluence, and corona worries were not significant, meaning that the difference in substance use before and during COVID-19 did not vary across gender, family affluence and corona worries.

Table 3

Repeated Measures ANOVA with Substance Use Before and During COVID-19 as Main Effect Time and Gender, Family Affluence and Corona Worries as Moderators and Age as Control Variable

	df	Mean Square	F	Sig.	Partial Eta Squared
Time	1	14.65	5.45	.020*	.014
Age	1	14.10	5.25	.023*	.013
Time*Gender	1	1.41	.52	.470	.001
Time*Family Affluence	2	2.09	.78	.460	.004
Time*Corona Worries	2	4.76	1.77	.172	.009

Note. * $p < .05$.

Discussion

The aim of this study was to examine the potential impact the COVID-19 crisis has on adolescent substance use (smoking, alcohol and cannabis use), by comparing adolescent substance use before and during COVID-19. In addition, it was investigated whether this change in substance use is moderated by gender, family affluence and corona worries. Equally high percentages of adolescents were found to use substances in fall 2019 and fall 2020 when analyzing smoking, alcohol and cannabis use individually. When analyzing the substances together as a sum score, a significant effect was found. The latter analyses indicated that adolescent substance use increased during the COVID-19 crisis compared to before the COVID-19 crisis. The results also found that gender, family affluence, and corona worries did not moderate this effect, indicating that comparable changes in substance use were found across these different groups.

First, in the introduction, two opposing expectations were formulated. Adolescent substance use was either expected to increase due to the stress adolescents experience because of the COVID-19 crisis (Ponnet et al., 2020), or to decrease because of Dutch government measures leading to limited contact with others, whereas substance use often happens in interaction with peers (Branstetter et al., 2011). Results revealed that adolescent smoking, alcohol and cannabis use before COVID-19 was not significantly different than substance use during COVID-19, when analyzed individually. The repeated measures ANOVA showed that the sum score of all substance use before COVID-19 and during COVID-19 significantly increased after controlling for age. The estimates marginal means

presented an increase of 0.1. Thus, there is some indication for a mild increase in substances when comparing fall 2019 with fall 2020. This is in line with the expectation that adolescent substance use would increase in order to cope with the COVID-19 crisis (Rogers et al., 2020; Abbey et al., 1993). Thus, for some adolescents, substance use may have been a way to cope with the psychological distress aroused by COVID-19. Additionally, the literature stated that reduced peer contact could lead to a decrease in adolescent substance use (De Looze et al., 2019). It could be the case that adolescents did not obey the restrictions of the Dutch government and therefore still interact with their peers, which could explain that their substance use has not decreased.

Not in line with the second hypothesis, this slight increase in substance use before and during COVID-19 was comparable across gender. Hypothesized was that the difference in substance use before and during COVID-19 was more substantial in boys than in girls. According to Nolen-Hoeksema and Harrell (2002), drinking seems to be more of a coping mechanism for boys than girls. Therefore, it was expected that the difference in substance use was more substantial for boys due to the stress they are experiencing from the pandemic than girls. An explanation for the lack of difference across gender could be that girls also used substances to cope with the COVID-19 crisis. According to McHugh (2018), girls reported that they use substances to deal with anxiety. When girls suffer from anxiety because of the COVID-19 crisis, they may also use substances as a coping mechanism as well as boys.

The third hypothesis has also been rejected. Expected was that the difference in substance use before and during COVID-19 was more substantial for adolescents with lower family affluence than adolescents with higher family affluence because they are more vulnerable due to the COVID-19 crisis and therefore use substances as a coping mechanism. This current study suggests that the difference in substance use before and during COVID-19 does not vary in family affluence. A possible explanation for the results found could be the fact the Dutch government has offered financial support for people affected by the COVID-19 crisis. That is why not many families were financially distressed and, therefore, not became more vulnerable due to the COVID-19 crisis than the other family affluence groups. As a result of this, no difference across family affluence groups was found between the substance use during COVID-19 compared to before COVID-19.

Lastly, it was hypothesized that the difference in substance use before and during COVID-19 was more substantial for adolescents with many corona worries than adolescents with fewer corona worries. Results were not in line with this hypothesis as the slight increase in substance use before and during COVID-19 was comparable across adolescents with

different levels of corona worries. During the COVID-19 crisis, many youth platforms have been created for adolescents, and helplines where they can share their worries about corona and find support (De Kindertelefoon, 2021). It is possible that these supportive platforms and helplines can offer an alternative to cope with worries they experience. As a result, the increase in substance use for adolescents who have many corona worries is not more substantial than for adolescents with fewer corona worries.

Strength and Limitations

A strength of this study is the use of longitudinal data of the YOUth Got Talent Project comparing pre-corona with a corona assessment. Because of the measurement of different substances and moderators over an extended period, the development of adolescent substance use can be linked to events in time, such as the COVID-19 crisis.

A limitation of this study is the operationalization of the variables. The variables smoking, alcohol and cannabis use were made dichotomous to fit the McNemar Test. As a result, only two categories were used: never and ever substance use in the last four weeks. As a result, a rough distinction is made in substance use, and the group of adolescents who use few substances are in the same group as those who use many substances. Further research can investigate whether there is a difference in low, medium and high substance use.

A second limitation is that the method of this study required a sum score of the substances to properly test whether changes in substance varied across subgroups. To test the moderators in the repeated measures ANOVA, the variables were made continuously, and a sum score was created by combining smoking, alcohol and cannabis use. As a result, it is not possible to see which individual substance use had an effect in combination with the moderators. Further research can focus on performing an analysis to test the moderators with the substances individually.

A third limitation is the dropout of many participants between T1 and T3 because of COVID-19. This may affect the validity, making this study less generalizable. Furthermore, this study is only conducted among MBO students. It is possible that the results would differ in students of HBO or University.

Lastly, a limitation of this study could be that only the participants that attended the online classes had filled in the questionnaire. The adolescents that did not participate in the classes may experience negative consequences of the COVID-19 crisis and therefore withdrawn themselves. It is feasible that they use substances as a coping mechanism, but these adolescents do not take part in this study, which would mean that the increase in

substance use would be much higher if they would be included.

Conclusion and Implications

This study indicates no change in substance use before and during COVID-19 when analyzing smoking, alcohol and cannabis use individually. However, when analyzing all substances together, the results suggest a slight increase in substance use during COVID-19 compared to before COVID-19. The difference in substance use before and during COVID-19 did not vary across gender, family affluence and corona worries. Due to conflicting results and only a slight increase found, it is useful to conduct further research before drawing conclusions about the potential impact of COVID-19 on adolescent substance use. However, this study offers a good starting point to investigate other possible consequences the COVID-19 crisis has on adolescents. Interventions can currently mainly focus on the impact of the COVID-19 crisis on the mental health of adolescents, since mainly due to the measures taken to reduce the spread of the coronavirus, a lot has changed in the daily lives of adolescents.

References

- Abbey, A., Smith, M. J., & Scott, R. O. (1993). The relationship between reasons for drinking alcohol and alcohol consumption: An interactional approach. *Addictive Behaviors, 18*(6), 659–670. [https://doi.org/10.1016/0306-4603\(93\)90019-6](https://doi.org/10.1016/0306-4603(93)90019-6)
- Bachman, J. G., O'Malley, P. M., Johnston, L. D., Schulenberg, J. E., & Wallace, J. M. (2011). Racial/ethnic differences in the relationship between parental education and substance use among U.S. 8th-, 10th-, and 12th-grade students: Findings from the monitoring the future project. *Journal of Studies on Alcohol and Drugs, 72*(2), 279–285. <https://doi.org/10.15288/jsad.2011.72.279>
- Bonomo, Y. A., Bowes, G., Coffey, C., Carlin, J. B., & Patton, G. C. (2004). Teenage drinking and the onset of alcohol dependence: a cohort study over seven years. *Addiction, 99*(12), 1520–1528. <https://doi.org/10.1111/j.1360-0443.2004.00846.x>
- Branstetter, S. A., Low, S., & Furman, W. (2011). The influence of parents and friends on adolescent substance use: A multidimensional approach. *Journal of substance use, 16*(2), 150–160. <https://doi.org/10.3109/14659891.2010.519421>
- Bronfenbrenner, U. (1992). Ecological systems theory. Jessica Kingsley Publishers.
- Daniel, J. Z., Hickman, M., Macleod, J., Wiles, N., Lingford-Hughes, A., Farrell, M., Araya, R., Skapinakis, P., Haynes, J., & Lewis, G. (2009). Is socioeconomic status in early life associated with drug use? A systematic review of the evidence. *Drug and Alcohol Review, 28*(2), 142–153. <https://doi.org/10.1111/j.1465-3362.2008.00042.x>
- De Kindertelefoon. (2021). *Alles Oké? Supportlijn alles is bespreekbaar*. Alles Oké? Supportlijn. Retrieved June 15, 2021, from <https://www.allesoke.nl>
- De Looze, M., van Dorsselaer, S., Stevens, G. W. J. M., Boniel-Nissim, M., Vieno, A., & Van den Eijnden, R. J. J. M. (2018). The decline in adolescent substance use across Europe and North America in the early twenty-first century: A result of the digital revolution? *International Journal of Public Health, 64*(2), 229–240. <https://doi.org/10.1007/s00038-018-1182-7>
- Dumas, T. M., Ellis, W., & Litt, D. M. (2020). What does adolescent substance use look like during the COVID-19 pandemic? Examining changes in frequency, social contexts, and pandemic-related predictors. *Journal of Adolescent Health, 67*(3), 354–361. <https://doi.org/10.1016/j.jadohealth.2020.06.018>

- Hassanbeigi, A., Askari, J., Hassanbeigi, D., & Pourmovahed, Z. (2013). The relationship between stress and addiction. *Procedia-Social and Behavioral Sciences*, 84(0), 1333-40. <https://doi.org/10.1016/j.sbspro.2013.06.752>
- Jacka, B. P., Phipps, E., & Marshall, B. D. L. (2020). Drug use during a pandemic: Convergent risk of novel coronavirus and invasive bacterial and viral infections among people who use drugs. *The International Journal on Drug Policy*, 83, 102895. <https://doi.org/10.1016/j.drugpo.2020.102895>
- Kuhn, C. (2015). Emergence of sex differences in the development of substance use and abuse during adolescence. *Pharmacology & Therapeutics*, 153, 55–78. <https://doi.org/10.1016/j.pharmthera.2015.06.003>
- Kuntsche, E., Knibbe, R., Gmel, G., & Engels, R. (2005). Why do young people drink? A review of drinking motives. *Clinical Psychology Review*, 25(7), 841–861. <https://doi.org/10.1016/j.cpr.2005.06.002>
- Lintonen, T. (2004). The reliability of self-reported drinking in adolescence. *Alcohol and Alcoholism*, 39(4), 362–368. <https://doi.org/10.1093/alcalc/agh071>
- McHugh, R. K., Votaw, V. R., Sugarman, D. E., & Greenfield, S. F. (2018). Sex and gender differences in substance use disorders. *Clinical psychology review*, 66, 12-23.
- Merton, R. K. (1938). Social structure and anomie. *American Sociological Review*, 3(5), 672. <https://doi.org/10.2307/2084686>
- Ministerie van Algemene Zaken. (2021, January 26). *Curfew*. Coronavirus COVID-19 | Government.Nl. <https://www.government.nl/topics/coronavirus-covid-19/curfew>
- Monahan, K. C., Rhew, I. C., Hawkins, J. D., & Brown, E. C. (2014). Adolescent pathways to co-occurring problem behavior: The effects of peer delinquency and peer substance use. *Journal of Research on Adolescence*, 24(4), 630–645. <https://doi.org/10.1111/jora.12053>
- Nolen-Hoeksema, S., & Harrell, Z. A. (2002). Rumination, depression, and alcohol use: Tests of gender differences. *Journal of Cognitive Psychotherapy*, 16(4), 391–403. <https://doi.org/10.1891/jcop.16.4.391.52526>
- Patel, J. A., Nielsen, F. B. H., Badiani, A. A., Assi, S., Unadkat, V. A., Patel, B., Ravindrane, R., & Wardle, H. (2020). Poverty, inequality and COVID-19: the forgotten vulnerable. *Public Health*, 183, 110–111. <https://doi.org/10.1016/j.puhe.2020.05.006>

- Ponnet, K., Hardyns, W., Anrijs, S., & Schokkenbroek, J. (2020). *Welzijn en relaties in tijden van corona: Bevindingen van een survey-onderzoek in België van 3-17 april, 2020*. <http://dx.doi.org/10.6084/m9.figshare.14498106>
- Rogers, A. H., Shepherd, J. M., Garey, L., & Zvolensky, M. J. (2020). Psychological factors associated with substance use initiation during the COVID-19 pandemic. *Psychiatry Research*, 293, 113407. <https://doi.org/10.1016/j.psychres.2020.113407>
- Schuler, M. S., Tucker, J. S., Pedersen, E. R., & D'Amico, E. J. (2019). Relative influence of perceived peer and family substance use on adolescent alcohol, cigarette, and marijuana use across middle and high school. *Addictive Behaviors*, 88, 99–105. <https://doi.org/10.1016/j.addbeh.2018.08.025>
- Simons-Morton, B. (2007). Social influences on adolescent substance use. *American Journal of Health Behavior*, 31(6), 672–684. <https://doi.org/10.5993/ajhb.31.6.13>
- Telzer, E. H., van Hoorn, J., Rogers, C. R., & Do, K. T. (2018). Social influence on positive youth development: A developmental neuroscience perspective. *Advances in child development and behavior*, 54, 215–258. <https://doi.org/10.1016/bs.acdb.2017.10.003>
- Torsheim, T., Cavallo, F., Levin, K. A., Schnohr, C., Mazur, J., Niclasen, B., & Currie, C. (2015). Psychometric validation of the revised family affluence scale: a latent variable approach. *Child Indicators Research*, 9(3), 771–784. <https://doi.org/10.1007/s12187-015-9339-x>
- Trucco, E. M. (2020). A review of psychosocial factors linked to adolescent substance use. *Pharmacology Biochemistry and Behavior*, 196, 172969. <https://doi.org/10.1016/j.pbb.2020.172969>
- Tsakpinoglou, F., & Poulin, F. (2017). Best friends' interactions and substance use: The role of friend pressure and unsupervised co-deviancy. *Journal of adolescence*, 60, 74-82. <https://doi.org/10.1016/j.adolescence.2017.07.005>
- WHO. (2021). *WHO Coronavirus (COVID-19) Dashboard*. World Health Organization. Retrieved June 11, 2021, from <https://covid19.who.int>