Summary

Juvenile delinquency in the virtual world
A new type of offenders or new opportunities for traditional offenders?

Background

Today's prevention of juvenile crime is primarily focused on traditional forms of crime. However, as young people spend more time online, this raises the question whether their delinquent behavior also shifts to the virtual world. The aim of this study is to identify the characteristics of juveniles who reported online offenses in the Youth Delinquency Survey (YDS). In addition, we intend to provide more insight into the extent to which delinquent behavior of juveniles shifts from the streets to the virtual world.

In this study, we do not use the term *crime*, because we focus on self-reported offending behavior. These self-reported offenses range from relatively minor offenses to prosecutable offenses, even within the same offense. We therefore use the term online delinquency instead of cybercrime. Within online delinquency, we make a distinction between *cyber-enabled* and *cyber-dependent* delinquency. Cyber-enabled delinquency refers to 'traditional' crimes that are committed by the use of Information Communication Technology (ICT), such as online threats, sexting and online fraud. Cyber-dependent delinquency refers to offenses that can only be committed using the ICT-structure, and involves acts that are primarily directed against computer or network resources, such as hacking, the spread of viruses and DDoS-attacks.

Studying the characteristics of online offenders and their similarities and differences with traditional offline offenders is important, because successful prevention of juvenile crime requires an offender-oriented approach. If online offenders are similar to offline offenders, the same prevention methods could be used for both types of offenders, whereas differences between the groups would require different approaches. The question is whether juveniles who report online offenses differ from juveniles who report offline offenses, and from juveniles who report both online and offline offenses regarding demographic characteristics, and risk and protective factors. Put differently, do juveniles who commit online offenses have a different profile than juveniles who commit offline offenses, and juveniles who commit both online and offline offenses? And, considering the (theoretical) distinction between cyber-enabled and cyber-dependent delinquency; do juveniles who commit cyber-enabled offenses, and juveniles who commit cyber-dependent offenses have a comparable profile?

The underlying question of this study is whether the observed juvenile crime drop can (partially) be explained by juveniles shifting from committing offline offenses to committing online offenses. By studying the profiles of on- and offline offenders in terms of risk and protective factors, and by making a comparison over time, we aim to provide more insight into whether online offenders are a new type of offenders, or whether the same types of juveniles who committed offline offenses before are now committing online offenses. This way, we are able to provide a first indication of whether there is a shift from offline delinquent behavior to online delinquent behavior amongst juveniles.

Summarizing, this study seeks an answer on the following three research questions:
1 What is the profile of juvenile offenders of self-reported cyber-enabled delinquency, and of juvenile offenders of self-reported cyber-dependent delinquency?
2 What distinguishes juvenile offenders of (different types of) online delinquency from juvenile offenders of offline delinquency?
3 To what extent is there a shift from offline to online offenses among juveniles?

To answer our research questions, we use three measurements (2005, 2010 and 2015) of the YDS. The YDS is a cross-sectional study on a national representative sample of juveniles aged 10 to 22 years in the Netherlands. In the current study we use information of 12- to 22-year-olds, as juveniles under the age of 12 years cannot be prosecuted in the Netherlands.
The first two research questions were answered using the YDS-2015. In the measurements of the YDS of 2005 and 2010, only a limited number of online offenses were included (i.e., (illegal) downloading, online threats and the spread of viruses). In the measurement of 2015, the number of online offenses has been extended to eleven types of offenses: six of these offenses refer to cyber-enabled offenses and five concern cyber-dependent offenses.
To answer the third research question, data of all three measurements of the YDS are used. In all three waves of the YDS, juveniles were asked about the same traditional offline offenses and risk and protective factors. Yet, since only minors were questioned in the measurements of 2005 and 2010, we restricted our sample to 12- to 17-year-olds for answering the third research question.

Table S1 Online offenses in the YDS-2015

Cyber-enabled offenses
Have you ever threatened someone through text messages, e-mails or in chatboxes?
Have you ever threatened someone through social media, such as WhatsApp, Facebook, Twitter, Instagram or Snapchat?
Have you ever sold something through the internet, but not sending out the goods after receiving payment?
Have you ever bought something through the internet, but not paying for the goods after receiving said items?
Have you ever distributed sexual material of minors (i.e., pictures or movies) through your (smart)phone or over the internet?
Have you ever impersonated somebody else on the internet?
Cyber-dependent offenses
Have you ever intentionally sent out viruses through e-mail or over the internet?
Have you ever logged on to somebody else's computer, email or social media account without their informed consent?
Have you ever tried to disrupt a website or email account by sending out large amounts of data?
Have you ever changed someone's account password (e.g., computer or social media) to prohibit them from accessing said account?
Have you ever logged on onto somebody else's computer, email or social media account without their informed consent, and manipulated or deleted information within?

Main findings

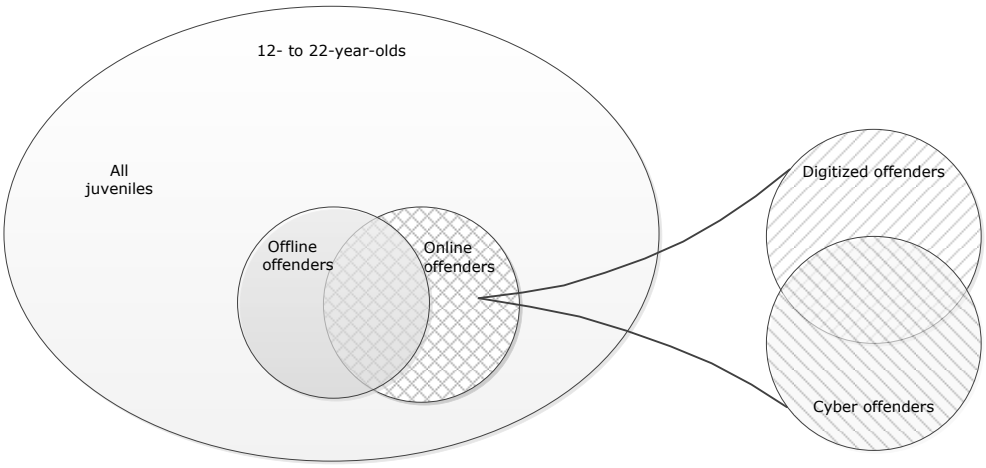
Which types of online delinquency can be distinguished based on the YDS-2015?

In order to gain more insight into the characteristics of online offenders, we first examined which types of online delinquency can be distinguished methodologically. We examined whether the theoretical difference between cyber-enabled delinquency and cyber-dependent delinquency is also observed in the YDS-2015.

- Based on the questions about offending in the YDS-2015, we identified two types of online delinquency: cyber-enabled delinquency and cyber-dependent delinquency.
- Cyber-enabled delinquency and cyber-dependent delinquency are also distinct from offline delinquency based on the YDS-2015.
- Note that the item 'impersonating someone else on the internet' is classified as a cyber-dependent offense, whereas previous research classified this item as a cyber-enabled offense.

Based on these findings, we assigned juveniles who participated in the YDS into different groups. Figure S1 provides a representation of the groups that we differentiated on the basis of the different types of online and offline delinquency. For readability, we use the term 'digitized offenders' to refer to juvenile offenders of cyber-enabled crimes, and the term 'cyber offenders' to refer to juvenile offenders of cyber-dependent crimes. For each of these groups, we identified their profile, and the extent to which they differ from each other in terms of risk and protective factors, gender, age and native origin.

Figure S1 Schematic overview of the distinguished groups of offenders



Profiles of juvenile online offenders

First, we examined the profiles of juvenile offenders of self-reported digitized offenses, and juvenile offenders of self-reported cyber offenses in terms of risk and protective factors, and gender, age and native origin. In doing so, we distinguished the following three groups: juveniles who report only cyber offenses, juveniles who report only digitized offenses, and juveniles who report both cyber- and digitized offenses.

- In total, 28,3% of the juveniles reported that they had committed an online offense in the twelve months prior to the interview of the YDS. Of those online offenders, 16,7% reported only cyber offenses, 5,2% reported only digitized offenses, and 6,4% reported both cyber- and digitized offenses.

Minors (12- to 17-year-olds)

- Cyber offenders are, compared with the other groups of online offenders, characterized by a higher likelihood to game on a frequent basis, to disapprove offline delinquency, to be open to their parents, and to have few friends who commit digitized crimes.
- Digitized offenders are, compared with the other groups of online offenders, characterized by a lower likelihood of being victims of cyber-dependent delinquency.
- Juveniles who report both cyber- and digitized offenses are, compared with the other groups of online offenders, characterized with the most high risk profile, i.e., greater presence of risk factors, and the lack of protective factors. This group is characterized by a higher likelihood to approve offline delinquency and to have friends who commit digitized offenses, but they have a lower likelihood to be open to their parents. Also, females, and juveniles of non-Dutch origin have a higher likelihood to belong to the group who reports both cyber- and digitized offenses in comparison to boys, and juveniles of Dutch origin.

Young adults (18- to 22-year-olds)

- Cyber offenders are, compared with the other groups of online offenders, characterized by a lower likelihood of being victims of offline crime, and to have friends who commit (digitized and offline) offenses.
- For digitized offenders we found no significant associations with the risk and protective factors.
- Similar to the results for minors, we found young adults who report both cyber and digitized offenses to have the most high risk profile. Juveniles in this group have, compared with the other groups of online offenders, a higher likelihood to have low levels of self-control, to be victims of online crime, to have friends who commit digitized offenses, and to be of Dutch origin.

Differences in the profiles of juvenile digitized offenders and juvenile cyber offenders

In addition to determining the profiles of juvenile online offenders, we also examined the differences between self-reported cyber and digitized offenders. The main differences between cyber offenders and digitized offenders, and between cyber offenders and juveniles who report both cyber- and digitized offenses are summarized in table S2 for minors, and S3 for young adults.

Minors (12- to 17-year-olds)

- We find clear differences between the profiles of cyber offenders and digitized offenders.
- Cyber offenders have a higher likelihood to game on a frequent basis, to disapprove offline delinquency, to be open to their parents, and to have fewer friends who commit crimes in comparison to digitized offenders, and juveniles who report both cyber- and digitized offenses.
- Cyber offenders, furthermore, have a higher likelihood of being victims of cyber-dependent crimes than digitized offenders.
- Minors who report both cyber and digitized offenses differ from cyber offenders, and digitized offenders, because this combination group contains a higher percentage of boys and juveniles of Dutch origin.

Table S2 Differences between profiles of cyber offenders versus profiles of digitized offenders and profiles of cyber- and digitized offenders (12- to 17-year-olds)

Cyber offenders versus digitized offenders	Cyber offenders versus cyber- and digitized offenders
Risk- and protective factors	Risk- and protective factors
More gaming	More gaming
More disapproval of offline delinquency	More disapproval of offline delinquency
More often victims of cyber offenses	
More open towards parents	More open towards parents
Fewer digitized delinquent friends	Fewer digitized delinquent friends
Control variables	Control variables
-	More often boys
	More often of Dutch origin

Young adults (18- to 22-year-olds)

- Cyber offenders have a less severe risk profile than digitized offenders, and juveniles who report being involved in both cyber- and digitized delinquency.
- Cyber offenders are characterized by a lower likelihood of being victims of online crime, and to have friends who commit offline and digitized offenses in comparison to digitized offenders, and juveniles who report both cyber- and digitized offenses.
- In comparison with digitized offenders, cyber offenders also have a lower likelihood to game on a frequent basis, and are older.
- Furthermore, in comparison with juveniles who report both cyber- and digitized offenses, cyber offenders have a higher likelihood of having high levels of self-control.

Table S3 Differences between profiles of cyber offenders versus profiles of digitized offenders and profiles of cyber- and digitized offenders (12- to 17-year-olds)

Cyber offenders versus digitized offenders	Cyber offenders versus cyber- and digitized offenders
Risk- and protective factors	Risk- and protective factors
	High levels of self-control
Less gaming	
Less often victims of offline offenses	Less often victims of offline crimes
Fewer offline delinquent friends	Fewer offline delinquent friends
Fewer digitized delinquent friends	Fewer digitized delinquent friends
Control variables	Control variables
More 21- and 22-year-olds	-

Differences in the profiles of juvenile online offenders and juvenile offline offenders

Next, we examined to what extent the profiles of juvenile online offenders differ from the profiles of juvenile offline offenders, and of juveniles who report both online and offline offenses. To examine these differences, we do not distinguish between cyber offenders, and digitized offenders, because these groups (taking into account offline offending) are too small for obtaining meaningful results. Hence, we distinguish four groups: juveniles who report no offenses, juveniles who report only online offenses, juveniles who report only offline offenses, and juveniles who report both offline and online offenses.

- The largest group consists of juveniles who report no offenses in the twelve months prior to the interview of the YDS (54,3%). 17,4% Of the juveniles report *only* offline offenses, 9,5% report *only* online offenses, and 18,8% report being involved in both online and offline offending.

The results of our study further show that juveniles who report no offenses are characterized by the most protective and lowest risk profile, while juveniles who report both online and offline offenses have the highest risk profile in terms of the presence of risk factors, and the lack of protective factors. Juveniles who report only online, or only offline offenses, fall in between these two extremes. This holds for both minors and young adults. The main differences between online offenders and offline offenders, and between online offenders and juveniles who report both offline and online offenses are summarized in table S4 for minors, and table S5 for young adults.

Minors (12- to 17-year-olds)
- Drugs use and a positive attitude towards offline delinquency are both associated with a lower likelihood to belong to the group offline offenders than to the group online offenders.
- Girls and juveniles of Dutch origin are more likely to belong to the group online offenders than to the group offline offenders compared to boys and juveniles of non-Dutch origin.
- We observe the largest differences between online offenders and juveniles who report both online and offline offenses.
- Online offenders are characterized by a lower likelihood of using drugs, to approve offline delinquency, to have (offline and digitized) delinquent friends, and they have a higher likelihood to be satisfied with school in comparison to juveniles who report both online and offline offenses.

Table S4 Differences between profiles of online offenders versus profiles of offline offenders and profiles of on- and offline offenders (12- to 17-year-olds)

Online offenders versus offline offenders	Online offenders versus on- and offline offenders
Risk- and protective factors	Risk- and protective factors
Less drug use	Less drug use
More disapproval of offline delinquency	More disapproval of offline delinquency
	Fewer offline delinquent friends
	Fewer digitized delinquent friends
	More satisfaction with school
Control variables	Control variables
More often girls	-
More often from Dutch origin	

Young adults (18- to 22-year-olds)
- Online offenders report less risk factors in comparison to offline offenders, and juveniles who report both online and offline offenses.
- Online offenders have a higher likelihood of having high levels of self-control, and a lower likelihood of using drugs, to be victims of offline crime, and to have offline delinquent friends in comparison to offline offenders.
- In comparison to juveniles who report both online and offline offenses, online offenders are characterized with a lower likelihood of using drugs, to be victims

of offline crime, to have offline delinquent friends, to engage in many online activities, and to approve digitized delinquency.

Table S5 Differences between profiles of online offenders versus profiles of offline offenders and profiles of on- and offline offenders (18- to 22-year-olds)

Online offenders versus offline offenders	Online offenders versus on- and offline offenders
Risk- and protective factors	Risk- and protective factors
High levels of self-control	
Less drug use	Less drug use
Less often victims of offline offenses	Less often victims of offline offenses
Fewer offline delinquent friends	Fewer offline delinquent friends
	Less online activities
	More disapproval of digitized delinquency
Control variables	Control variables
-	-

Shift from offline delinquency to online delinquency?

Lastly, we investigated whether we could find any indications for a shift from offline to online delinquency among juveniles who participated in the YDS. A shift from offline to online delinquency is one of the explanations suggested for the observed decline in juvenile offline delinquency. If this explanation is true, it is to be expected that juveniles who previously reported offline offenses commit fewer offline offenses over time, and instead (also) commit online offenses. The three waves of the YDS do not offer the opportunity to study the possible shift from offline to online delinquency directly. This would require longitudinal data, where the same juveniles are questioned about their delinquent behavior on a regular basis. The YDS, however, is a cross-sectional study carried out in three different years. Furthermore, the number of online offenses has been extended to eleven online offenses in the last measurement of the YDS (the wave of 2015). As a result, it is not possible to study the developments in online delinquency for all eleven offenses over time.

It is possible though to give a first indication for a possible shift from offline to online delinquency on the basis of the data from the YDS. The traditional offline offenses did not change in the various waves of the YDS. In addition, in all three waves juveniles were asked to report on (the same) risk and protective factors that are associated with offending.

Given the available data, we employed three methods to examine if we could find any evidence for a shift from offline to online delinquency among juveniles.

Trends in offline and online offending

First, we investigated trends in the prevalence and frequency of self-reported offline delinquency, and two online offenses that were measured in all three waves of the YDS; online threats and the spread of viruses. The results of these analyses do *not* point in the direction for a shift from offline to online delinquency. Although we observe a decrease in the prevalence and frequency of self-reported offline delinquency, we found no evidence that juveniles' involvement in committing online threats and sending viruses has increased. The prevalence of self-reported online threats and sending viruses remained stable, while the frequency of online threats and sending viruses has decreased over time. Yet, it is the question whether the same results are to be found when more online delinquent acts were available over time.

Exposure and sensitivity
Second, we examined whether there are any indications for a shift from offline to online delinquency based on trends in the correlates of delinquent behaviour. More specifically, we investigated whether there are changes in the extent to which juveniles are exposed to risk factors related to delinquency (i.e., exposure), and in the extent to which the associations between risk factors and on- and offline delinquency have changed over time (i.e., sensitivity). We have specifically examined these changes for online and offline threats, as threats is the only offense in the YDS with both an offline and online component. In case of a shift from offline to online delinquency, we expect risk factors that are associated with offline delinquency, to be more strongly associated with online delinquency over time (i.e., a change in sensitivity).
The results of these analyses do *not* point in the direction of a shift from offline to online delinquency: the relationship between various risk factors and offline delinquency, online threats and offline threats have not changed over time. The results of our study do indicate, however, that juveniles are less exposed to risk factors that are associated with delinquency, which offers a possible explanation for the decrease in offline delinquency over time.

Model estimates
The third and final method we used to examine a possible shift from offline to online delinquency are model estimates. Using data of the YDS-2010, we first identified the profiles of juvenile offenders and non-offenders. Based upon these profiles we predicted which juveniles in the YDS-2015 would commit offline offenses. Next, we compared the *predicted* classification with the *observed* classification in on- and offline offending (no offending, only online offending, only offline offending and both online and offline offending) in the YDS-2015. This way, we tested whether juveniles for whom we expected that they would commit offline offenses (based on the profiles of 2010) also indicated to commit offline offenses, or that they have shifted from committing offline offenses to committing online offenses, or that they have committed both offline and online offenses in 2015. The results based on these model estimates show some support for the supposed shift from offline to online delinquency among 12-to 17-year-olds. Yet, we observe this shift only for a small proportion of juveniles.

Concluding, we found limited support for the proposition that juveniles have shifted from committing traditional offline offenses to committing online offenses. Only the results of the model estimates show some support for the supposed shift from offline to online delinquency. Yet, it should be noted that two of the three applied methods are based on only two online offenses.

Conclusion

The results of our study show that based on self-reported data among a representative sample of 12- to 22-year-olds online delinquency can be distinguished methodologically in cyber-enabled and cyber-dependent delinquency. In addition, these types of online delinquency are also distinct from offline delinquency. Next, we observe clear differences between juveniles who commit online offenses, and juveniles who commit offline offenses with regard to risk and protective factors. Juveniles who report both offline and online offenses have, in comparison to juveniles who commit only online offenses, and juveniles who commit only offline offenses, the most high risk profile. Within the group online offenders, juveniles who commit both cyber-

and digitized offenses have the highest risk profile. Cyber offenders have the lowest risk profile among online offenders based on self-reported data (i.e., they report more protective factors, and less risk factors compared to other groups of offenders). As such, this may indicate that cyber offenders are a new type of online offenders.

The finding that self-reported cyber offenders have the lowest risk profile may also indicate a lack of relevant risk factors in the measurements of the YDS to characterize cyber offenders. To determine profiles of online offenders we relied on the *risk factor model*. This model is designed for understanding why juveniles commit delinquency offline. The results of our study indicate that some of these risk factors also apply to self-reported online delinquency. Yet, the question is whether new explanations are required for explaining cyber delinquency. For instance, the *risk factor model* may be extended with a digital domain. Digital risk and protective factors, such as social media use, digital activities and programming skills, are often missing in research on online delinquency, even though juveniles increasingly spend time online.

Also, we recommend future studies to further investigate how police- and judicial records can be used to distinguish offline delinquency from online delinquency to verify whether our results hold when using data sources other than self-reported data. Moreover, we recommend to explore whether alternative (online) sources, such as data from social media, can be used to measure online delinquency.

Lastly, we investigated whether we could find any indications for a shift from offline to online delinquency among juveniles who participated in the YDS. Based on the available data, we employed three methods to examine the possible shift from offline to online delinquency among juveniles. Only the results of the model estimates show some support for the supposed shift from offline to online delinquency, even though we observe this shift only for a small proportion of juveniles.

In conclusion, the results of this study provide insights into the extent to which juvenile online offenders differ from juvenile offline offenders. Based on self-reported data among a representative sample of Dutch juveniles, particularly cyber offenders seem to be a distinct group of offenders, with different characteristics compared to offenders who commit traditional, offline offenses. It is therefore questionable whether existing interventions can be used to prevent these cyber offenders from (re)offending. Furthermore, using self-report data we found limited support for a shift from offline to online delinquency among juveniles. To gain more insight into the presumed shift from offline to online delinquency, we recommend future studies to test this shift on the basis of other data sources.