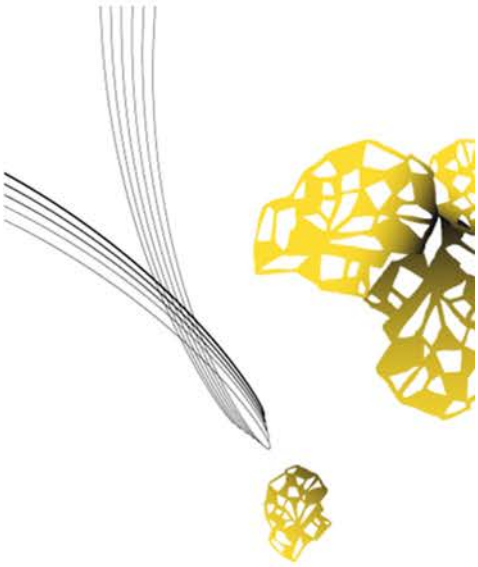
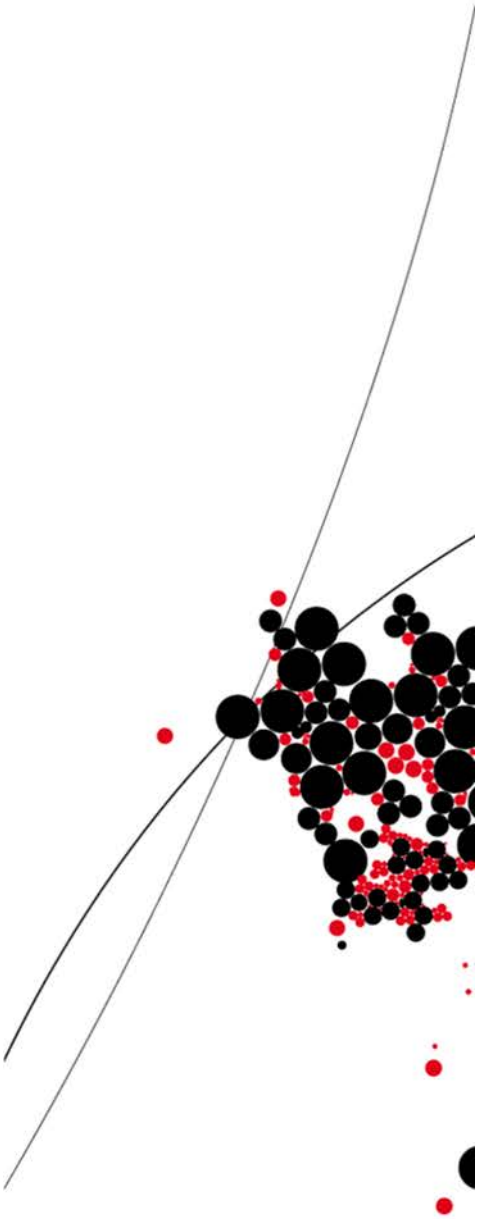
Homann, Julia



Bachelor Thesis

An Investigation into the Role of Risk Opportunity in the Relationship between Delinquency and Extraversion



UNIVERSITY OF TWENTE.

Faculty of Behavioural, Management, and Social Sciences (BMS)

Psychology of Conflict, Risk, and Safety

Abstract

While the link of some personality traits to adolescent delinquency is well-established, the relationship between extraversion and delinquency seems to be ambiguous. A possible reason why studies have not found evidence for this relationship between extraversion and delinquency might be that a third variable, namely risk opportunity to engage in delinquency, influences this relationship in a substantial manner. Thus, the current study combined a mediation hypothesis with a moderation hypothesis in order to shed more light onto the role of risk opportunity. First, it was investigated whether risk opportunity might play a mediating role in the relationship between extraversion and delinquency. Second, to experimentally test and manipulate the amount of risk opportunity a participant experiences, the Columbia Card Task ('CCT'; Figner, Mackinlay, Wilkening & Weber, 2009) was used. It was hypothesised that, independent of the risk opportunity condition, extraverted people take more risks on the CCT than introverted people. For extraverts, there is an increase in CCT risk taking from the low to the high risk condition whereas for introverts, the amount of CCT risk taking remains equal across the low and the high risk condition. To test this, participants (N= 68, *M*age= 17.79) first filled in a self-report questionnaire concerning questions about delinquency, risk opportunity to delinquency and extraversion. Afterwards, the CCT was played, for which participants were randomly distributed across the high risk and the low risk opportunity conditions. No mediating effect of extraversion in the relationship between risk opportunity to delinquency was found (*B*= -.01, *SE*= .02, CI [-.06, .04]). Additionally, risk taking on the CCT did not significantly differ between the low risk and the high risk condition (*p*= .31). Neither, was there any evidence for the moderating role of extraversion in the relationship between CCT risk condition and CCT risk taking [F (1,56)= .90, *p*= .35]. The current study suggested that delinquency operates independently from the personality trait extraversion, as well as from the risk opportunity to engage in delinquency. Also for the CCT, risk opportunity condition and the level of extraversion seemed irrelevant for the amount of risk taking. However, in the current study it was questionable whether the manipulation on the CCT worked as intended. Still, the current study added valuable methodological insights for future researchers through the idea to investigate risk taking in a multi-modal way.

Introduction

Typically, adolescence is considered to be the period in life where individuals behave most riskily. However a meta-analysis by Defoe, Dubas, Figner and van Aken (2015) showed that children and adolescents actually show equal levels of risk taking on behavioural tasks (e.g. the Columbia card task [Figner, Mackinlay, Wilkening & Weber, 2009]). Corresponding to popular opinion however, in real-life we observe that adolescents engage in more actual risks than children. It can be asked how this discrepancy between risk taking tasks and real-life risks arises. One factor that might explain those two contradicting findings is the actual risk opportunity that adolescents find themselves exposed to. In real-life, with increasing age adolescents get exposed to more risk opportunities which might result in more risk taking behaviour (Defoe, Dubas, & Romer, 2019). These risk opportunities can be of a social (e.g. parental control), as well as of a physical nature (e.g. disadvantaged neighbourhoods).

The present study offers a possible explanation as to why adolescents engage in more risks, specifically delinquency, through researching the additional concept *risk opportunity*. Additionally, it is already fairly well established that personality traits are related to delinquency (Ljubin-Golub, Vrselja, & Pandžić, 2017). Yet the influence of the personality trait extraversion has a rather ambiguous influence in the existing literature which is why further elaboration is needed. The current study focuses on delinquency as an example of risk taking behaviour and investigates risk opportunity and extraversion as predictors. Moreover, risk taking is evaluated on the CCT to test for an interaction effect of CCT risk condition and extraversion.

Delinquency

Delinquency has grown to be an essential problem throughout the last decades. As the legal dictionary defines it, “juvenile delinquency is the participation by a minor child, usually between the ages of 10 and 17, in illegal behaviour or activities” ("Delinquency”, n.d.). For purposes of the current study, individuals between 16 and 19 years of age will be considered as adolescents. This is based on the traditional definition of adolescence from 11 to 19 years, used in the study of Defoe et al. (2015). Delinquent offenses by adolescents commonly include the following: “theft, burglary, vandalism, drug and alcohol offenses, tobacco use, weapons possession, disorderly conduct, assault and battery, traffic violations, trespassing, fraud, false reporting, unauthorised use of a motor vehicle” (Global Youth Justice, n.d.). In the current study, the definition of delinquency excludes the consumption of substances.

One of the most accepted findings in criminology is the *Age-Crime Curve* which universally correlates age to delinquency (Hirschi & Gottfredson, 1983). In Western societies,

the prevalence of delinquency "tends to increase from late childhood, peak in the teenage years (from 15 to 19) and then decline in the early 20s" (Nationale Institute of Justice, n.d.). There are different versions of this curve, depending on the type of committed crime, gender, and ethnicity. For example, delinquent acts involving theft peak earlier than acts involving violence. Girls reach a peak of delinquency earlier in the teenage years than boys, and disadvantaged minority boys commonly engage longer and more intensively in delinquency (Hirschi & Gottfredson, 1983; Nationale Institute of Justice, n.d.). According to Terrie Moffitt (1993), 95% of the delinquent youth stop offending after adolescence. The remaining five percent of adolescents that continue committing crimes are mostly men (Terrie Moffitt as cited in Act for Youth, 2001).

Fortunately, the Netherlands have seen a constant drop in their general crime rate in the last few years (Centraal Bureau voor de Statistiek, 2017). Thereunder, also juvenile delinquency rates have dropped. Whereas in 2007, 20 percent of crimes in the Netherlands were connected to a juvenile offender, in 2017 this rate dropped to 12 percent (Centraal Bureau voor de Statistiek, 2017). However, much delinquent behaviour remains unreported, so the dark number of juvenile delinquents might be higher. Moreover, the mentioned statistics present official criminal records. However in self-reports, which will be the method of the current study (Research Question 1), a different picture might emerge. Even though this is a pleasant decrease, juvenile delinquency is still a big problem in the current world which can have devastating effects, both for the individual and for society as a whole. As stated by Defoe, Dubas, and Romer (2019) adolescents can get into a vicious cycle through risk behaviours that is difficult to escape. Being delinquent might make adolescents face legal consequences which in turn hinders their school education and leads to disadvantages for their future career.

Extraversion and Delinquency

The Big Five Inventory as a personality measurement gained wide acceptance due to being an easy and short conceptual framework that is able to assess personality across different age groups with consistently high validity and reliability (Morizot, 2014). Thus, the Big Five Inventory will be used as a conceptual framework in the current study. The personality trait extraversion is one of the five dimensions of the Big Five. This scale ranges from extraversion to introversion, meaning that "some people are expressive, outgoing, and comfortable in interacting with their surroundings – while others are reserved, quiet, and more comfortable alone" (16 Personalities, n.d.). The main difference between extraverts and introverts is about how they maintain their energy and gratification. While extraverts use their environment and

their social surroundings for becoming energised, introverts get energy through spending time alone (Young & Rees, 2012).

Regarding the link between extraversion and delinquency, Eysenck published a theory of criminal personality in which he explains the PEN model (1990, as cited in Ljubin-Golub et al., 2017). PEN stands for three personality traits, being psychoticism, extraversion, and neuroticism. Those dimensions are mostly innate and biological. According to Eysenck, if a person scores high on all three of these dimensions, this person is likely to be a criminal offender (as cited in Ljubin-Golub et al., 2017; "Hans Eysenck's PEN Model Of Personality," n.d.). Assuming from his theory, extraversion should be related to juvenile delinquency and will be the subject of investigation of the present study. While the links between the two other dimensions psychoticism and neuroticism to delinquency are well-established, there is disagreement among experts about extraversion's relatedness to delinquency since the body of literature is constituted of mixed findings. Some studies found a positive relationship between those two constructs (Young & Rees, 2012; Duran-Bonavila, Vigil-Colet, Cosi, & Morales-Vives, 2017), while others were only able to find partial relationships (Romero, Luengo, & Sobral, 2001) and again others could not find any relationship between extraversion and delinquency (Heaven & Virgen, 2001; Fonseca & Yule, 1995).

Confirming Eysenck's theory of criminal personality, there are several studies showing that extraverted individuals are more likely to engage in illegal activities than introverted individuals. For instance, Young and Rees (2012) mentioned that extraverts feel the need to have a lot of activity going on in their life. Consequently, the possibility is higher that extraverts engage in delinquent activities to excite themselves. Likewise, the study of Duran-Bonavila et al. (2017) was conducted with three samples from Spain of 12 to 21 year olds that differ in their level of delinquency. The finding was that the juvenile offender sample and the at-risk sample had significantly higher levels of extraversion than the community sample. This indicates that high levels of extraversion in clinical at-risk samples can be associated with delinquency. The current study, however, will shed light on the questions whether higher levels of extraversion within community samples also has a predictive value for adolescent delinquency.

Similarly but more differentiated, the study of Romero et al. (2001) found a partial relationship between extraversion and delinquency. Their participants were institutionalised boys and non-institutionalised adolescents between 14 and 20 years living in Spain. Romero et al. (2001) suggest that while slightly delinquent behaviour is associated with high extraversion, more serious delinquency is not related to extraversion. Rather, severe delinquency is associated

to diminished social skills. In the study of Romero et al. (2001), extraversion was mainly associated to girls' offending behaviour in the long term.

In contrast to these presented studies, the study of Heaven and Virgen (2001) and the study of Fonseca and Yule (1995) did not find any effect of extraversion in relation to delinquency. Heaven and Virgen (2001) investigated the relationship between the three PEN dimensions and delinquency in 12 to 15 years old boys attending school in Australia. Whereas they found a strong correlation for the psychoticism scale, there were no effects for the subscales extraversion and neuroticism. Likewise, the study of Fonseca and Yule (1995) could not find any distinctions on PEN's extraversion scale between their samples. They did not find any significant differences between violent and non-violent adolescent's extraversion.

To conclude, the relation of extraversion to delinquency is rather ambiguous: some studies find a correlation, others only found partial and conditional evidence for a correlation, and a third group did not find any correlation. Moreover, most previous relevant studies appear to be conducted over a decade ago, which is why the current study is needed to investigate more recent developments (Research Question 1a).

Risk Opportunity and Delinquency

As discussed above, an important factor in the execution of risk taking is risk opportunity, since more risk opportunity results in more engagement. Risk opportunity can be defined as the "structural conditions of access and target availability" (Lagrange & Silverman, 2006). The opportunity to risk might be one of the reasons why adolescents engage in particularly more risks than children. As Gerrard, Gibbons, Houlihan, Stock, and Pomery (2008) state, there is a rise in risk opportunities while growing into adulthood. Moreover, Young and Rees (2012) investigated that there is an increased risk taking in adolescence which might be due to the following discrepancy: when entering adolescence, individuals are faced with more liberty due to less social control. However in their adolescent years, individuals lack the abilities and knowledge to successfully deal with the gained freedom.

Although a lot of research in the literature already focuses on social risk opportunity, there has been little research about the physical risk opportunity of adolescents. For instance, the study of Lagrange and Silverman (2006) showed that risk opportunity in adolescence is mainly determined by the level of adult supervision. Due to the lack of research into physical risk opportunities, the current study will put a special emphasis on investigating the participant's physical risk opportunity in their neighbourhood, e.g. possibility to steal from a store (Research Question 1b).

All the aforementioned delinquency statistics and articles relate to real-life risk taking. However, risk taking in general can also be measured in a laboratory through behavioural risk taking tests. It is difficult to use real-life risk taking as a measure for empirical research because this assessment has to rely on self-reports. Yet, risk taking situations can be re-enacted using a behavioural risk taking test (e.g. the *Columbia Card Task*). This task can be used to estimate the risks participants are willing to take in real-life situation.

An interesting question in this context arises from the meta-analysis of Defoe et al. (2015). This study showed that children and adolescents take the same risks on laboratory risk taking tasks, but in reality, it is apparent that more adolescents take risks and engage in delinquency than children. It might be that in a laboratory setting, children and adolescents have the same risk opportunity conditions because they do not depend on external factors. This raises the interesting assumption that risk opportunity is an important determinant of engaging in risk taking. Thus in the current study, a laboratory behavioural risk taking task will be executed by the participants to investigate whether risk conditions have an effect on adolescent risk taking. Like this, all participants are exposed to the same risks which allows a direct comparison of risk taking. Additionally, the amount of risk opportunity will be experimentally manipulated, resulting in a low risk and a high risk condition, which indicates how the amount of risk opportunity influences risk taking (Research Question 2a).

Extraversion and Risk Opportunity

Whereas a lot of research has been conducted on the relationship between extraversion and delinquency, little is known about the relationship between extraversion and risk opportunity. The question at hand is whether extraverted individuals experience more risk opportunities due to their physical environment displaying more high-risk situations? The aim of the current study is to investigate this question, first through asking about it in a self-report questionnaire (Research Question 1c) and second, through experimentally manipulating the risk opportunity and investigating its relationship to extraversion (Research Question 2b).

Added Value of the Current Study

Thus, the current study focuses on adding the variable of risk opportunity to the already investigated relationship between extraversion and delinquency. One reason why the existing body of literature found such ambiguous evidence for the relationship might be that there exists no direct relationship, but that the mediator risk opportunity might facilitate an indirect effect (Research Question 1). This assumption is similar to the findings of Mann, Kretsch, Tackett,

Harden and Tucker-Dob (2015). In this study, it was found that peer deviance (i.e. social risk opportunity) mediates the relationship between the personality trait sensation seeking and delinquency. Since excitement seeking, which resembles the personality trait sensation seeking, is regarded as a sub-facet of extraversion (John & Srivastava, 1999), it can be assumed that the mediation effect of risk opportunity also extends to the relationship between extraversion and delinquency (Mann et al., 2015).

First, this hypothesis will be investigated via a correlational self-report assessment using a questionnaire. Hereby, risk opportunity is assumed to act as a mediator in the relationship between extraversion and delinquency (Research Question 1). Secondly, this assumption can be strengthened by using the CCT as an additional assessment tool (Research Question 2). By means of this, extraversion is handled as the interacting variable in the relationship between CCT risk condition and CCT risk taking. The CCT is a performance based assessment which allows for manipulating the risk opportunity through introducing a low risk and a high risk condition of the CCT. This constitutes the added value of the study since it does not solely rely on self-report measures, but aims to strengthen the self-report statements via a performance based assessment which is manipulated in terms of risk opportunity.

The Current Study

From the earlier mentioned age crime curve (Hirschi & Gottfredson, 1983), it is assumed that the current sample adapts a similar distribution of delinquency. Additionally, taking the PEN theory of Eysenck (1990, as cited in Ljubin-Golub et al., 2017) into account, it is expected that extraversion is an important personality trait in relation to adolescent delinquency. Even though the link in the mentioned literature is ambiguous, the current study attempts to increase the clarity of the results.

Thus the current study investigates two main research questions. First, we investigate "Does extraversion predict delinquency via risk opportunity to engage in delinquency?" with three sub-questions as follows: (1a) Does extraversion predict delinquency?, (1b) Does opportunity to engage in delinquency predict delinquency over and beyond extraversion? and (1c) Does extraversion predict opportunity to engage in delinquency? It is expected that risk opportunity operates as a mediator in the relationship between extraversion and delinquency. Since a partial mediation effect is expected, the predictive value of extraversion on delinquency should become smaller while the predictive value of extraversion on risk opportunity and the predictive value of risk opportunity on delinquency should be significant.

Second, we investigate “Is the effect of risk opportunity on the Columbia Card Task risk taking moderated by extraversion?” with two sub-questions as follows: (2a) Does risk opportunity predict risk taking on the CCT? And (2b) is the hypothesised effect of risk opportunity on CCT risk taking moderated by extraversion? Here, it is expected that the relationship between risk condition and risk taking on the CCT strengthens when extraversion is included into the model as a moderating variable. For extraverts, experiencing the low risk condition leads to a moderate amount of risk taking on the CCT. Experiencing the high risk condition as an extravert, however, will increase their risk taking on the CCT. For introverts, the CCT risk condition does not influence their level of risk taking on the CCT. Introverts take the same amount of risk in the low and in the high risk condition. Still, in the both risk conditions, the amount of risks taken by the extraverts is higher than the risks taken by introverts.

Methods

Design and Participants

The current study consisted of a survey and an experimental design on youth risk behaviour. In total, 68 participants were recruited. For filtering out the cases with missing data, the Little’s MCAR test was applied to test whether the data was missing completely at random which indicates that there are no significant differences between the two samples. Since the data in the current study was indeed missing completely at random (p = .721), all participants remained in the sample. Thus, the sample consisted of 68 adolescents from various secondary vocational education programs, i.e. MBO’s (*M*age = 17.79; *SD*age= 1.512; 65% female, 35% male; 41% MBO year 1, 59% MBO year 2). Participants were 16 to 23 years old, but 88% of the sample fell into the age range between 16 to 19 years. Of the participants, 94% were Dutch, while 2% were Turkish and 4% of another nationality. A major part of the sample had no religion (56%), whereas the remaining participants were Christian (30%), Islamic (4%) and of another religion (7%). All participants in the current sample lived with their parents or caregivers. The participating classes were randomly assigned to the low risk and high risk condition on the CCT (41% low CCT risk condition, 59% high CCT risk condition). The data was collected in April and May 2019 in the East Netherlands region Twente. Approval of the Ethics Committee of the BMS faculty at the University of Twente was granted beforehand.

Procedure

Participants were recruited using the convenience sampling method. Through an internet research, around 50 schools were contacted to participate in this study. An invitation email was set up and send via email to the possible schools. Two to four working days after sending out the email, the schools were called again in case they did not reply yet. In the end, four MBO schools and five primary schools were willing to participate in the research. The data collected at the primary schools was not needed for purposes of the current study and thus, ignored in the following. At the beginning of the data collection session, participants were informed that their school agreed to participate but if they themselves do not want to participate, they can refuse to take part.

As soon as everything was set up for the data collection by the researchers, the students entered the class room and found the computer with their name tag. They were welcomed and the general purpose, guidelines and procedure of the data collection session were explained. The participants were reminded to be honest and careful in answering the questions and playing the game, as well as confidentiality and anonymity of the data was ensured. Then, each participant first worked through the questionnaire in OpenSesame (Mathôt, Schreij & Theeuwes, 2012) which consisted of 37 questions. They were asked demographic questions and afterwards 30 multiple choice questions about various risk taking behaviour and different personality traits. The questionnaire was designed in Dutch and participants took approximately 15 minutes to fill out the questionnaire.

After completing the questionnaire, the participants started one of the CCT conditions to which they were randomly assigned per class. The researchers demonstrated and explained how to play the CCT on a beamer/laptop in front of the class. Like this, the participants could easily follow the steps on their own computer. After getting a go from the researcher, the participants started the actual 24 rounds of the CCT. At the end of the session, participants could choose to either immediately receive a 5€ voucher or decide to participate in a raffle of a 150€ voucher which took place among all participants of the research at the end of the data collection. Additionally, at the end of the CCT, there was a small raffle using the amount of points the participants won while playing the CCT. With this raffle, at the end of the data collection one participant was randomly chosen to get a prize of 10€.

Measures

Delinquency. The participant's history of delinquency was measured with some questions from a delinquency scale introduced in the studies of Junger-Tas, Terlouw and Klein

(1994) and Baerveldt, Rossem, and Vermande (2003). According to the definition of delinquency used in this study, theft ("Have you ever stolen anything from a store or department store?"), vandalism ("Have you ever intentionally destroyed something like a bus/tram booth, a window, a seat in the tram/train or a car?; Have you ever worked with markers or paint on the street or inside or outside a building [for example at school]?") and contact with the police ("Have you ever done anything for which you were arrested by the police?") were used to estimate delinquency. For the data collection, the questions were translated and presented in Dutch. For all four items, there were five answer categories ranging from 'never' (0) to 'yes, three or more times in the last 12 months' (4). In order to get an estimate of the participant's history of delinquency, a mean score was calculated. In the current study, good internal reliability of the scale was indicated with alpha = .78. Similarly, in the study of Baerveldt et al. (2003) an alpha was calculated that reflects excellent reliability (alpha = .91).

Risk Opportunity. For measuring the opportunity to delinquency that participants experience, three of the four questions used to investigate delinquency were re-formulated. The questions were re-formulated so they focus on the opportunity to engage in the behaviour instead of asking for the frequency of carrying out the behaviour. For instance, the opportunity to steal was assessed by asking: "If I wanted, there are many occasions where I could steal something from a store". The question concerning contact with the police was re-formulated to "There is often crime in my neighborhood". Those questions, too, were translated to Dutch for the data collection. All four items were answered within five answer categories from 'Completely agree' (0) to 'Completely disagree' (4). The current study showed good reliability with an alpha = .82.

Extraversion was measured using "the abbreviated, 15-item Big Five questionnaire" (McManus, Livingston, & Katona, 2006). From this questionnaire, the extraversion subscale was extracted and used in the present study ("I really enjoy talking to people"). With the help of co-researchers, these questions were translated into Dutch. There were five answer categories ranging from 'Totally disagree' (0) to 'Totally agree' (4). A mean score was calculated from this. This scale showed moderate reliability (alpha = .63; alpha = .53) in earlier studies (Furnham et al., 2003; McManus & Furnham, 2006; respectively). In the present study, the extraversion scale had a moderate reliability with alpha = .48.

CCT Risk Taking. In order to get an objective measure of the participant's risk taking, the hot version of the *Columbia Card Task* (Figner et al., 2009) was used. The CCT is a game consisting of 24 rounds where participants are shown a card desk of 32 cards which are turned around so that their value is not visible (see Appendix for pictures of the CCT conditions). In

this card desk, there are two kinds of cards: 31 to 29 winning cards and 1 to 3 losing cards, depending on the specific round. Moreover, there are different gain and loss amounts assigned to the winning and losing cards, respectively. For instance, in one round one winning card earns 10 or 30 points whereas one losing cards costs 250 or 750 points. Thus, there is a risk to get a bad overall score if one acts too risky and decides to turn around a lot of cards. Furthermore in every round, there is a limited amount of time (i.e. 30 seconds) for turning around cards. The aim of the game is to achieve the highest score possible within this time frame. Based on this score, one person will receive a 10€ reward at the end of the research. Two conditions were created in order to experimentally manipulate the amount of risk opportunity the participants' experience: the low risk and the high risk condition. In the low risk condition, there was a 'no card' button available in which participants had the possibility to always play it safe. Through clicking on the 'no card' button, there was no risk of losing anything because the game immediately skipped to the next round (see Appendix, Figure A3). In the high risk condition, however, this 'no card' button did not exist which means participants always had to turn at least one card before stopping the round (see Appendix, Figure A4). This increases the risk of losing points, because there is a heightened chance that participants get a loss card which will give a bad overall score. These two versions of the CCT give an indication how participants act according to the CCT risk condition they experience. From the amount of flipped around cards per round, a mean score of risk taking was calculated.

Statistical Approach

For purposes of data analysis, SPSS Statistical Package for the Social Sciences, version 24, was used. Moreover, all used tests were two-tailed and an alpha of .05 was applied to all tests. For testing the first hypothesis, a mediation analysis was conducted using the PROCESS tool of Hayes (2017) with the dependent variable *delinquency*, the independent variable *extraversion* and the possible mediator *risk opportunity*. Additionally, *gender* was introduced as a covariate (coded as a 0= men, 1= women). The result could either be a partial or a complete mediation effect. A partial mediation effect occurred if the relationship between extraversion and delinquency gets weaker when controlling for risk opportunity while the relationships between extraversion and risk opportunity, and risk opportunity and delinquency becomes significant. A full mediation effect occurred in the case that the direct relationship between extraversion and delinquency becomes non-significant while the indirect relationship through risk opportunity turns significant.

In order to test the second hypothesis, a moderation analysis was carried out using a factorial ANOVA. To conduct the moderation analysis, the dependent variable *CCT risk taking*, the independent variable *CCT risk condition* and the moderator *extraversion* were used. The variable CCT risk condition is, in contrast to the risk opportunity variable in the mediation analysis, a dichotomous variable generated from the low risk condition (coded as 0) and the high risk condition (coded as 1) of the CCT. Additionally, the continuous variable extraversion was turned into a categorical variable using a median split (Allen, 2017). A moderation effect occurred if the interaction term of CCT risk condition*extraversion shows a significant relation with the dependent variable.

Results

Firstly, the data was tested for a normal distribution using skewness and kurtosis analyses. Bulmer's interpretation for skewness (1979) was used to make sense of the skewness scores. Since there is less consensus in the academic field about interpretation rules for kurtosis, Field (2013) and Chissom (1970) were used as a guideline. A kurtosis that is approximately 0 is normally distributed, while a kurtosis < 0 is flattened and a kurtosis > 0 is distributed with a high peak.

Three of the four continuous variables in the current study were approximately normally distributed. The variable CCT risk taking was approximately normally distributed with a skewness of -.19 (*SD*= .29) and a relatively higher peak with a kurtosis of .46 (*SD*= .57). An approximately normal distribution with a skewness of -.07 (*SD*= .29) and a high peak with a kurtosis of -1.33 (*SD*= .57) was created by the risk opportunity variable. Extraversion was approximately normally distributed with a skewness of -.52 (*SD*= .29) and a relatively high peak with a kurtosis of .75 (*SD*= .57). The only problematic, non-normally distributed variable is delinquency. The scores are highly skewed to the right 3.14 (*SD*= .29) and have a higher peak than normally 10.77 (*SD*= .57).

Table 1 shows the descriptive statistics of the variables in the current study. The delinquency mean score of the participants in the current sample is rather low (M= .33, SD= .63) with 57% of the sample that has never engaged in any delinquency. Moreover, there is a significant difference (*p*= .00) between the male delinquency score (*M*= .70, *SD*= .91) and the female delinquency score (*M*= .11, *SD*= .22). On the CCT, participants flipped 8.83 (*SD*= 2.20) cards on average. Taking the high and low CCT risk condition into account, there is an non-significant difference between the amounts of flipped cards (*p*= .31). In the high risk condition,

participants flipped 9.06 (*SD*= 2.20) cards on average, while participants flipped 8.51 (*SD*= 2.20) cards on average in the low risk condition. Unexpectedly CCT risk taking did not significantly correlate with delinquency (r= -.04), but it did slightly correlate in the low risk condition (r= .20) and in the high risk condition (r= -.17). Surprisingly, the overall correlation and the correlation in the high risk condition are both negative, while the correlation in the low risk condition is positive. It was assumed that higher delinquency leads to higher CCT risk taking, independent from the CCT risk condition. However, it turned out that for the high risk condition, high delinquency leads to less risk taking on the CCT.

As expected, significant Pearson Correlations for gender were found. Gender correlated significantly with delinquency (r= -.45) and risk opportunity (r= .34). Regarding the direction of these correlations, in real life high delinquency and high risk opportunity are more strongly correlated to men than to women.

Table 1.

Means, Standard Deviations and Correlations of the Variables

Measures	1	2	3	4	5	6	7	*M*	*SD*
1. CCT risk taking	-							8.83	2.20
2. CCT risk taking (low risk condition)	-	-						8.50	2.20
3. CCT risk taking (high risk condition)	-	-	-					9.06	2.20
2. Delinquency	-.04	.20	-.17	-				0.32	0.63
3. Risk Opportunity	-.04	-.24	.16	.21	-			1.61	1.10
4. Extraversion	-.04	-.03	-.06	.18	-.05	-		2.67	0.58
6. Gender	.05	-.23	-.20	-.45*	-.34*	-.05	-	17.79	1.51

*p < .05.

Mediation Analysis

A mediation analysis was carried out using the PROCESS macro to test the first hypothesis that risk opportunity mediates the relationship between extraversion and delinquency. Gender was used as a covariate due to a general consensus in the academic field that boys engage more frequently in delinquency than girls. However as can be seen in Figure 2, the analysis revealed no significant results for the mediation model. Path c with the direct effect from extraversion to delinquency showed no significant effect (*B*= .17, *SE*= .12, CI [-.06, .41]). Neither path a, indicating the main effect from extraversion to risk opportunity (*B*= -.13, *SE*= .22, CI [-.56, .31]), nor path b of the main effect from risk opportunity to delinquency, is significant (*B*= .05, *SE*= .07, CI [-.09, .18). Path c', indicating the indirect effect of extraversion via risk opportunity to delinquency, turns out to be non-significant, too (*B*= -.01, *SE*= .02, CI [-.06, .04]). The covariate gender showed significant relationships to both risk opportunity (*B*= -.79, *SE*= .26, CI [-1.32, -.26]) and delinquency (*B*= -.54, *SE*= .15, CI [-.84, -.23]). To conclude, the current study did neither find a main effect of extraversion on delinquency, nor a mediated effect from extraversion through risk opportunity to delinquency. For this reason there is not enough evidence to reject the null hypothesis

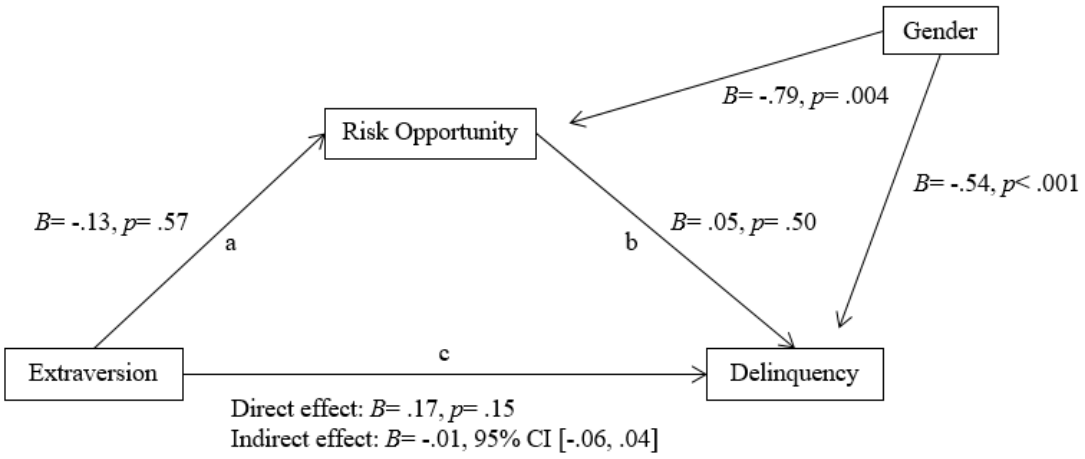


Figure 1. Model of extraversion as a predictor of delinquency, mediated by the variable risk opportunity.

Moderation Analysis

In order to test the second hypothesis that the relationship between CCT risk condition and CCT risk taking is strengthened by the moderator extraversion, a factorial ANOVA was executed. The continuous variable extraversion was made into a categorical one, using a median split. The cut off score for distinguishing between introverts and extraversion was 2.67 and categorised 60% of the sample as introverts and 40% as extraverts. The results of the ANOVA

showed no significant main effects, neither for CCT risk condition to CCT risk taking [F (1,56)= .55, *p*= .46], nor for extraversion to CCT risk taking [F (1,56)= .36, *p*= .55]. Moreover, the analysis revealed no interaction effect for CCT risk condition*extraversion on CCT average [F (1,56)= .90, *p*= .35]. To conclude, the level of extraversion did not strengthen or weaken the relationship between CCT risk condition and CCT risk taking. This means that the null hypothesis, that extraverts take risks according to the risk condition and that introverts take equal risks across the risk conditions, cannot be rejected.

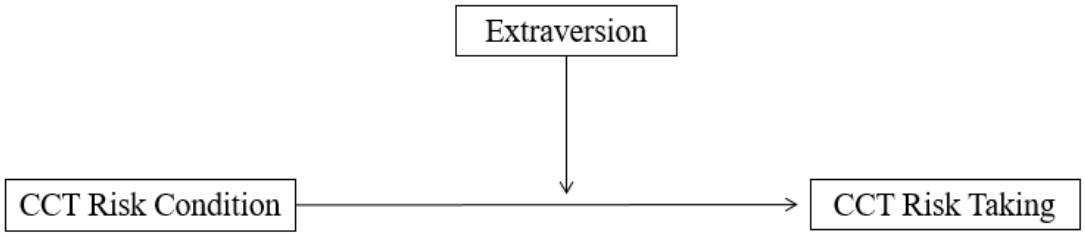


Figure 2. Moderation Model with extraversion as a moderator in the relationship between CCT Risk Condition and CCT Risk Taking.

Discussion

The aim of the current study was to investigate the risk taking behaviour of Dutch adolescents. Since previous findings regarding the relationship between extraversion and delinquency were ambiguous, it was hypothesised that the variable risk opportunity might work as an important mediator in this relationship which has been neglected so far. Moreover, the interaction of the CCT risk condition and extraversion was hypothesised to influence CCT risk taking. These hypotheses were tested multi-modally by means of a questionnaire survey and an experimental task - the Columbia Card Task (CCT; Figner et al., 2009) - which made it possible to experimentally manipulate the experienced CCT risk opportunity. Unexpectedly, both research questions turned out to be non-significant. That means, first, risk opportunity does not influence the way in which extraversion and delinquency are related. Extraversion and delinquency are not related in the current study, neither directly nor indirectly through risk opportunity (Research Question 1). Second, the level of extraversion did not influence the way in which CCT risk condition affected CCT risk taking. Especially since the low or high risk condition on the CCT did not change the amount of risk that was taken on the CCT (Research Question 2).

Delinquency

Compared to a national study in the USA about normality of delinquency scores (Van den Oord, Pickles, & Waldman, 2003), the delinquency mean score in the current sample (*M*= .33) fell into a normal range. That study extracted the normality score for delinquency from the *National Longitudinal Study of Adolescent Health* in the US (*M*= .58, *SD*= 1.58). However, the average mean scores for delinquency look significantly different for men and women in the current sample. This gender effect was already a well-established effect in the literature which is the reason why some studies only included a male sample from the outset (Heaven & Virgen, 2001), and others split their samples to do separate analyses among men and women (Romero et al., 2001). Thus, the current study controlled for gender too since a significant correlation with risk opportunity and delinquency was found.

Extraversion and Delinquency

The comparison of the current study to other studies that have investigated the relationship between extraversion and delinquency manifest different set ups of the studies which might have led to the different results. Studies which have found a relationship, compared institutionalised samples with community samples (Duran-Bonavila et al., 2017; Romero et al., 2001) and incorporated a broader, more inclusive definition of delinquency, focusing among other things on substance use (Romero et al. (2001). Those might be reasons why the current study did not find the expected relationship between extraversion and delinquency.

First, the current study contradicts the PEN theory of Eysenck (1990, as cited in Ljubin-Golub et al., 2017). According to the PEN theory, a delinquent person scores high on the three personality traits psychoticism, extraversion and neuroticism. The current study specifically investigated the relationship between extraversion and delinquency, but could not find a relationship here which contradicts Eysenck's whole theory. However, Eysenck developed a special personality inventory for estimating this relationship (Eysenck & Eysenck, 1964). Thus, the discrepancy in the results might stem from the fact that this original questionnaire was not used in the current study.

In line with Eysenck's theory, the study of Duran-Bonavila et al. (2017) found a relationship between extraversion and delinquency. However, they included a community sample, an at-risk sample and a delinquent sample into their study. Since the current study only included a community sample, it was not possible to compare a highly delinquent sample with a community sample. The current study only evaluated delinquency scores from a community sample. This might have made it less likely to find an effect. Moreover, the questionnaire of

Duran-Bonavila et al. (2017) mainly focused on aggression instead of on the delinquency concept that was used for the current study.

Similarly, the findings of the current study are rather contradicting to the findings in the study of Romero et al. (2001). For that study, one institutionalised male sample and two community samples were used. Contrary to the current results, it was found that extraversion is only connected to slightly delinquent behaviour, not to heavily delinquent behaviour. Moreover, according to the study of Romero et al. (2001), extraversion is more relatable to female than to male offending. The current study showed a gender effect for delinquency, but not for extraversion. A possible reason for this discrepancy between the two studies could be that Romero et al. (2001) included only a highly delinquent boys into their sample. Another reason could be a different way of framing delinquency. That study focused on rule breaking ("Run away from home") and drug involvement as components of delinquency which the current study excluded from the definition. Extraversion might be more related to rule breaking and drug involvement than to the components of delinquency investigated in the current study, because these two aspects might be inherently more connected to a social environment. Especially drug involvement during adolescence is oftentimes strongly associated with one's peer group (McDonald, 2008).

Consistently with the current study, the study of Heaven and Virgen (2001) did not find a relationship between delinquency and extraversion even though the setup of the two studies were similar. In the study of Heaven and Virgen (2001), self-report delinquency questionnaires were administered in a school setting to a community sample. In comparison to the aforementioned studies which confirmed the PEN theory, the study of Heaven and Virgen (2001) and the current study might highlight methodological difficulties when investigating delinquency only with community samples through a self-report questionnaire. It seems as if comparing a community sample with delinquent samples yields to more revealing results. Yet the study of Heaven and Virgen (2001) focused on 12 to 15 year old boys which still makes it questionable in how far the study's results are comparable to the current results.

To summarise, the current study puts a different focus on the relationship between extraversion and delinquency by trying to establish a mediation effect with risk opportunity in a community sample. Since, there are no studies with the same focus than the current study, it is difficult to compare the results.

Risk Opportunity and Delinquency

All the aforementioned studies only investigated the relationship between extraversion and delinquency. It was hypothesised that introducing physical risk opportunity into the model would create an indirect relationship between the variables extraversion and delinquency, as it was shown in the study of Mann et al. (2015) who found that social risk opportunity mediated the relationship between sensation seeking and delinquency. It was assumed that the study of Mann et al. (2015) is comparable to the model tested in the current study. However, it might be that physical and social risk opportunity are too different to be comparable.

Thus, it is possible that the risk opportunity to delinquency is more about the social risk opportunities than physical risk opportunities that people experience. For instance, the study of Lagrange and Silverman (2006) concluded that adult supervision is the main component of risk opportunity in adolescence. Similarly, the findings of Mann et al. (2015) highlighted peer deviance as the main risk opportunity to engage in delinquency. However, except for the current study, there are no studies until now which investigate physical risk opportunity to delinquency which makes the current study hardly comparable. Still, methodologically the current study gives an added value to the existing literature.

Extraversion and Risk Opportunity

Concerning the relationship between extraversion and risk opportunity, the current study could not find any relationship between those two constructs. Since there are no prior studies about this relationship, comparisons to other research cannot be made. However, as already elaborated above, the issue involved might be that physical risk opportunity was investigated instead of social risk opportunity. Especially for the personality trait extraversion, social risk opportunity might play a bigger role than physical risk opportunity due to the inherent social nature of this personality trait. Particularly, concepts involving social relationships like peer delinquency and parental supervision seem to be related to delinquency which gives rise to the assumption that social risk opportunities might be more related to extraversion. (Lagrange & Silverman, 2006; Mann et al., 2015).

Strengths and Limitations

Even though no significant results were found in the current study, the added value of the current study to the existing literature is still valid. This study made important contributions in terms of new ideas to resolve ambiguities in the academic field. Introducing physical risk opportunity as a variable in the relationship between extraversion and delinquency all together

seemed to be a new idea. No study before has tried to investigate risk taking through both, a self-report measurement and an experiment with manipulating CCT risk condition. Thus, there are no comparisons whether other studies found an effect for this experiment. Moreover, the idea of a multi-modal way to evaluate risk taking through a self-report questionnaire and a laboratory task, is new regarding the relationship between extraversion and might be able to resolve ambiguities in the future. A multi-modal way of assessing this topic is likely to reflect a more accurate and comprehensive picture of risk taking tendencies than only relying on self-report data. Additionally, the current study was the first one to adapt the CCT with a timer of 30 seconds. Since the current study did not investigate the effect of the timer, future research could focus on the timers' influence on CCT risk taking.

Although the proposed ideas of the current study can be of use in the future, there are also some limitations to the current study which future researchers should pay attention to. Concerning the first hypothesis, the self-report measurement that was used might have not given the best possible results due to issues of subjectivity, honesty and social desirability. Moreover, the introspective capacity of adolescents about personality traits cannot be guaranteed (McDonald, 2008). However, these disadvantages were tried to make up for by introducing a second, more objective measurement (i.e. the CCT) into the current study.

Still, there was not enough evidence to support the second hypothesis either. A possible explanation why this was not the case, might be that the CCT as a measurement is not comparable to real-life risk taking. From the data collection session, the impression was gained that some participants might not have taken the game seriously. Some seemed to perceive it only as a fun game, instead of playing it as a way of estimating real-life risk taking. Another question is whether the manipulation of CCT risk condition worked as intended. Participants indicated that they just chose the 'no card' option in the low risk condition out of curiosity or to be finished earlier. These comments make it questionable whether the manipulation indeed worked and whether it is possible to make a significant discrimination between a low and high risk condition. Even though generally the validity and reliability of the CCT has proven to be good (Buelow & Barnhart, 2018), in the current study the usefulness of the game as an estimate of real life risk taking is not reproducible.

Unfortunately, only the CCT risk conditions were randomly assigned to the classes but no counterbalancing of the order of questionnaire and CCT was undertaken. It might be that the results found in this study are due to the ordering of the questionnaire and the CCT since risk taking on the CCT could have increased or decreased after becoming aware about one's actions and personality traits in the questionnaire. Moreover, the current study only controlled for inter-

individual differences but not for intra-individual differences. Evaluating intra-individual differences in the low and high risk condition might have given a more global picture of the way that risk conditions influence risk taking.

Another reason for not finding enough evidence to support the research questions may be the execution of the data collections. It was not always possible to follow the data collection manual that was made in advance to ensure standardisation. Sometimes spontaneous adjustments had to be made which consequently introduced confounds into the current study. The three most important confounds will be explained in the following and should be avoided for future research. First, there were no loss cards in the low risk opportunity condition on the CCT. The researchers noticed this issue too late to make any adjustments. This can be regarded as a confound for the manipulation of risk opportunity on the CCT since the manipulation cannot only be attributed to the amount of experienced risk opportunity. Second, the teachers were walking around in the classroom and thus were able to see their students' answers on the questionnaire. This might have influenced the honesty of the participants. Especially, the delinquency questions might have suffered from this un-confidential way of treating the data. Third, the instructions of the high risk opportunity on the CCT still mentioned the 'no card' button. Even though the participants did not seem to be confused about this, it might have influenced the results in an uncontrollable manner.

Moreover, the sample size (N= 68) of the current study might have been too small to find significant results for a relationship between extraversion, risk opportunity and delinquency. Related, some participants in the current study were older than expected which can be seen as a limitation because it might have distorted the results. A sample from 16 to 23 year olds was gained, whereas the aim was to get 16 to 19 year's olds. Due to an already small sample size and because the age from 20 to 23 can still be considered as late adolescence (Giedd, 2010), the participants were kept in the sample. Concerning the analysis of the second research question with a median split, its undeniable disadvantage is that the data is losing power and it becomes less likely to find an effect. By categorising the sample into two groups, all values in the two groups are treated equally despite their evident differences (Allen, 2017).

Taking those limitations and strengths into consideration, future research should continue investigating the role of risk opportunity in relationship to delinquency. Especially due to the current lack of knowledge about physical risk opportunity, future research should focus on examining the role of physical risk opportunity in the relationship between personality traits and delinquency. Since physical risk opportunities can be better prevented and acted against than social risk opportunities, gaining more knowledge in this area could be of

substantial societal value to prevent risk taking behaviours among adolescents. From a legislative point of view, it is easier and more feasible to take care of physical risk opportunities in adolescents' life, for instance through increasing the prevalence of police officers or CCTV cameras, then it is to change the social environment in their family and friends group. In this manner, educating about social risk opportunities is important but direct physical measures to reduce risk opportunities can be more readily implemented.

Moreover, future research should continue trying to experimentally manipulate risk opportunity instead of relying on self-report data only. Especially for sensitive topics like risk taking behaviour, self-report measures might not give valid results. Additionally, it would be interesting to execute this research in an intra-individually comparative manner to evaluate how experimentally manipulating risk opportunity changes the way a participant plays the CCT. Thus, this study can give inspiration for the methodological way of conducting future research in this area.

Conclusion

To conclude, no evidence was found for a link between extraversion and delinquency, nor for a mediating role of risk opportunity in this relationship. Furthermore, the hypothesis that extraverts take more risks than introverts on a risk taking game, no matter whether it is a high or low risk condition, was not supported. Thus, the current study proposes that delinquency is neither related to one's level of extraversion, nor to the risk opportunity a person is experiencing. Moreover, experimentally influencing the risk opportunity did not change the risk taking behaviour of extraverts in a risk taking game. Yet for future research, the current study adds valuable methodological insights and ideas to the existing body of literature.

References

16 Personalities. (n.d.). Mind: Introverted vs. Extraverted. Retrieved from https://www.16personalities.com/articles/mind-introverted-vs-extraverted

Act for Youth. (2001). *Research Facts and Findings: Adolescent Delinquency*. Retrieved from http://www.actforyouth.net/resources/rf/rf_delinquency_0902.pdf

Allen, M. (2017). *The sage encyclopedia of communication research methods* (Vol. 1-4). Thousand Oaks, CA: SAGE Publications. doi: 10.4135/9781483381411

Baerveldt, C., Rossem, R. van, Vermande, M. (2003). Pupils' delinquency and their social networks: a test of some network assumptions of the ability and inability models of delinquency. *The Netherlands' Journal of SocialSciences, 39*, 107-125.

Buelow, M.T. & Barnhart, W.R. (2018). Test–Retest Reliability of Common Behavioral Decision Making Tasks. *Archives of Clinical Neuropsychology*, *33*(1), 125–129.doi: 10.1093/arclin/acx038

Bulmer, M. G. (1979). *Principles of Statistics* (Dover). New York: Dover.

Centraal Bureau voor de Statistiek. (2017, October 9). Further drop in registered crime and suspect rates. Retrieved from https://www.cbs.nl/en-gb/news/2017/41/further-drop-in-registered-crime-and-suspect-rates

Chissom, B.S (1970). Interpretation of the Kurtosis Statistic. *The American Statistician, 24*(4), 19-22, doi: 10.1080/00031305.1970.10477202

Cohen, J. (1988). Statistical power analysis (2nd ed.). Hillsdale NJ: Erlbaum.

Defoe, I. N., Dubas, J. S., Figner, B., & Van Aken, M. A. (2015). A meta-analysis on age differences in risky decision making: Adolescents versus children and adults. *Psychological Bulletin, 141*(1), 48-84. doi:10.1037/a0038088

Defoe, I.N , Dubas, J.S, & Romer, D. (2019). Heightened Adolescent Risk-Taking? Insights From Lab Studies on Age Differences in Decision-Making. *Policy Insights from the Behavioral and Brain Sciences, 6*(1), 56 –63. doi:10.1177/2372732218801037

Delinquency. (2016, July 1). In *Legal Dictionary*. Retrieved from https://legaldictionary.net/delinquency/

Duran-Bonavila, S., Vigil-Colet, A., Cosi, S., & Morales-Vives, F. (2017). How Individual and Contextual Factors Affects Antisocial and Delinquent Behaviors: A Comparison between Young Offenders, Adolescents at Risk of Social Exclusion, and a Community Sample. *Frontiers in Psychology, 8*. doi:10.3389/fpsyg.2017.01825

Eysenck, H. J., & Eysenck, S. B. G. (1964). Manual of the eysenck personality inventory.

London: University of London Press.

Field, A. (2013). *Discovering Statistics using IBM SPSS Statistics* (4th ed.) London: Sage Publications Ltd.

Figner, B., Mackinlay, R. J., Wilkening, F., & Weber, E. U. (2009). Affective and deliberative processes in risky choice: Age differences in risk-taking in the Columbia Card Task. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 35*, 709–730. http://dx.doi .org/10.1037/a0014983

Fonseca, A. C., & Yule, W. (1995). Personality and antisocial behavior in children and adolescents: An enquiry into Eysenck's and Gray's theories. *Journal of Abnormal Child Psychology*, *23*(6), 767-781. doi:10.1007/bf01447476

Furnham, A., McManus, I. C., & Scott, D. (2003). Personality, empathy and attitudes to animal welfare. *Anthrozoös, 16*, 135-146.

Gerrard, M., Gibbons, F. X., Houlihan, A. E., Stock, M. L., & Pomery, E. A. (2008). A dual-process approach to health risk decision making: The prototype willingness model. *Developmental Review*, *28*(1), 29-61. doi:10.1016/j.dr.2007.10.001

Giedd, N. (2010). Adolescent brain maturation. In R. E. Tremblay, M. Boivin, & R. Peters (Eds.), *Encyclopedia on early childhood development*. Retrieved from http://www.child-encyclopedia.com/documents/ GieddANGxp.pdf

Global Youth Justice. (n.d.). Top 25 Crimes, Offenses and Violations. Retrieved from https://www.globalyouthjustice.org/resources/top-25-crimes/

Hans Eysenck's PEN Model Of Personality. (n.d.). Retrieved February 20, 2019, from https://www.psychologistworld.com/personality/pen-model-personality-eysenck

Hayes, A. (2017). Introduction to Mediation, Moderation, and Conditional Process Analysis, Second Edition (2nd ed.). New York: Guilford Publications.

Heaven, P. C., & Virgen, M. (2001). Personality, perceptions of family and peer influences, and males' self-reported delinquency. *Personality and Individual Differences*, *30*(2), 321-331. doi:10.1016/s0191-8869(00)00049-0

Hirschi, T., & Gottfredson, M. (1983). Age and the Explanation of Crime. *American Journal of Sociology*, *89*(3), 552-584. doi:10.1086/227905

John, O. P., & Srivastava, S. (1999). The Big-Five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research, 2*, 102–138. New York: Guilford Press.

Junger-Tas J, Terlouw GJ and Klein MW (eds) (1994). *Delinquent Behaviour Among Young*

People in the Western World: First Results of the International Self-report Delinquency Study. Amsterdam: Kugler.

Lagrange, T. C., & Silverman, R. A. (2006). Low self-control and opportunity: Testing the General Theory of Crime as an explanation for gender differences in delinquency. *Criminology*, *37*(1), 41-72. doi:10.1111/j.1745-9125.1999.tb00479.x

Ljubin-Golub, T., Vrselja, I., & Pandžić, M. (2017). The Contribution of Sensation Seeking and the Big Five Personality Factors to Different Types of Delinquency. *Criminal Justice and Behavior*, *44*(11), 1518-1536. doi:10.1177/0093854817730589

Mann, F.D., Kretsch, N.S., Tackett, J.L., Harden, K.P., & Tucker-Drob, E. (2015). Person × Environment Interactions on Adolescent Delinquency: Sensation Seeking, Peer Deviance and Parental Monitoring. *Personality and individual differences, 76*, 129-134. doi:10.1016/j.paid.2014.11.055

McDonald, J.D. (2008). Measuring Personality Constructs: The Advantages and Disadvantages of Self Reports, Informant Reports and Behavioural Assessments. *Enquire. (1)*1. 75-94.

McManus, I. C. & Furnham, A. (2006). Aesthetic activities and aesthetic attitudes: Influences of education, background and personality on interest and involvement in the arts. *British Journal of Psychology*, *97*(4), 555-87. doi:10.1348/000712606X101088

McManus, I. C., Livingston, G., & Katona, C. (2006). The attractions of medicine: the generic motivations of medical school applicants in relation to demography, personality and achievement. *BMC Medical Education, 6*(11).doi: 10.1186/1472-6920-6-11

Mathôt, S., Schreij, D., & Theeuwes, J. (2012). OpenSesame: An open-source, graphical experiment builder for the social sciences. *Behavior Research Methods, 44*(2), 314-324. doi:10.3758/s13428-011-0168-7

Morizot, J. (2014). Construct Validity of Adolescents' Self-Reported Big Five Personality Traits. *Assessment, 21*(5), 580-606. doi:10.1177/1073191114524015

Nationale Institute of Justice. (n.d.). From Juvenile Delinquency to Young Adult Offending. Retrieved from https://www.nij.gov/topics/crime/Pages/delinquency-to-adult-offending.aspx

Romero, E., Luengo, M., & Sobral, J. (2001). Personality and antisocial behaviour: study of temperamental dimensions. *Personality and Individual Differences*, *31*(3), 329-348. doi:10.1016/s0191-8869(00)00139-2

Van den Oord, E., Pickles, A., & Waldman, I.D. (2003). Normal variation and abnormality:

an empirical study of the liability distributions underlying depression and delinquency. *The Journal of Child Psychology and Psychiatry, 44*(2), 180-192. doi: 10.1111/1469-7610.00112

Young, J. T., & Rees, C. (2012). Social Networks and Delinquency in Adolescence: Implications for Life-Course Criminology. *Handbook of Life-Course Criminology*, 159-180. doi:10.1007/978-1-4614-5113-6_10

Appendix

Appendix 1: Screenshots of the Columbia Card Task (CCT; Figner, Mackinlay, Wilkening & Weber, 2009)

Figure A3. Screenshot of the Columbia Card Task, low risk condition with the 'no card' button.

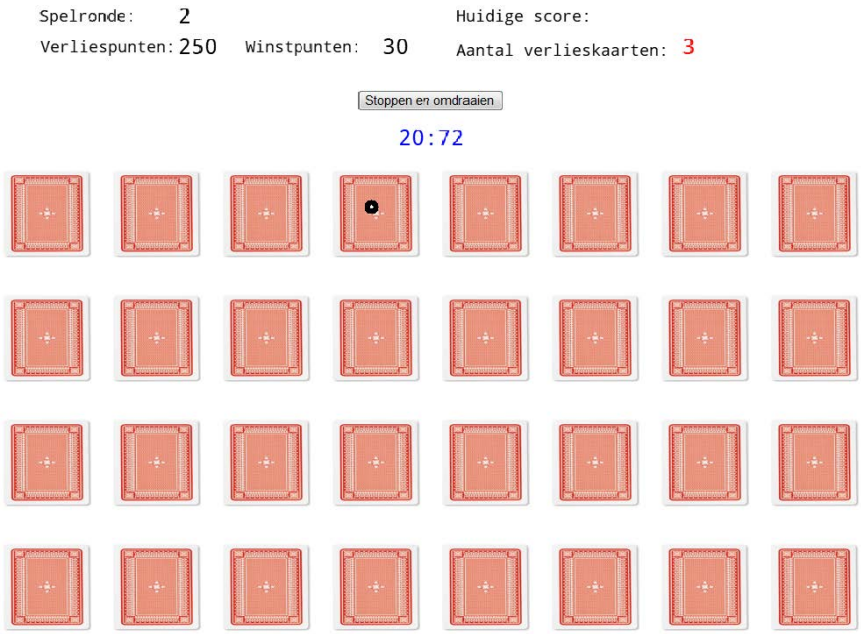


Figure A4. Screenshot of the Columbia Card Task, high risk condition.