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**Low Self-Control and its Impact on Adolescent
Delinquency: Insights from the ISRD 4 Study**

Nízká sebekontrola a její dopad na delikvenci mládeže:

Poznatky ze studie ISRD 4

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Prohlášení

Prohlašuji, že jsem diplomovou práci vypracovala samostatně, že jsem řádně citovala všechny použité prameny a literaturu a že práce nebyla využita v rámci jiného vysokoškolského studia či k získání jiného nebo stejného titulu.

Declaration

I hereby declare that I have prepared this thesis independently, that I have properly cited all used sources and literature, and that this thesis has not been utilized in any other higher education studies and neither for obtaining a different or the same degree.

In Prague on the 21st of June 2024

Tereza Vlčková



Abstrakt

Tato studie zkoumala vztah mezi sebekontrolou a delikvencí mladistvých se zaměřením na rozdíly mezi offline a online delikvencí. Ke studii byla využita data ze 4. vlny International Self-Report Delinquency Study (ISR-4), přičemž vzorek byl tvořen 2115 českými adolescenty ve věku 12 až 21 let. Sběr dat probíhal na jaře 2023 v Praze a Plzni, a to v 8. a 9. třídách základních škol, ekvivalentních ročnících víceletých gymnázií a v prvních dvou ročnících středních škol. Faktoriální ANOVA odhalila, úroveň sebekontroly se významně liší v závislosti na typu školy. Vliv pohlaví nebyl statisticky významný. Korelační analýza ukázala, že nižší sebekontrola je spojena s vyšší mírou delikvence, přičemž tato souvislost byla signifikantně významnější u chlapců. Logistická regrese dále prokázala, že sebekontrola a pohlaví významně ovlivňují pravděpodobnost zapojení se jak do tradiční, tak do kybernetické delikvence, přičemž u chlapců byly pozorovány vyšší sklony k delikventnímu chování, a to zejména v online prostředí. Tyto výsledky naznačují, že posílení sebekontroly je pro snížení delikvence klíčové, a zároveň že sebekontrola má větší vliv na offline než na online delikvenci. Je tedy zapotřebí dalšího výzkumu, který by identifikoval prediktory specifické pro kyberkriminalitu a umožnil tak vývoj specifických přístupů k řešení offline a online delikvence. Celkově studie zdůrazňuje význam cílených intervencí, které zohledňují vzdělávací prostředí, rozdíly mezi pohlavími a unikátní charakteristiky různých forem delikvence.

Klíčová slova: delikvence; kyberkriminalita; sebekontrola; adolescenti; ISR-4

Abstract

The current study investigated the relationship between self-control and juvenile delinquency, focusing on differences between offline and online offences. Using data from the 4th wave of the International Self-Report Delinquency Study (ISRD-4), the sample comprised 2115 Czech adolescents aged 12 to 21. Data collection was conducted in spring 2023 in Prague and Pilsen, involving 8th and 9th grade students from elementary schools, equivalent grades from multi-year grammar schools, and the first two years of high schools. Factorial ANOVA revealed that self-control levels significantly differ across school types, whereas the effect of sex was nonsignificant. Correlational analysis showed that lower self-control is associated with higher delinquency, with a significantly stronger correlation observed in boys. Logistic regression further identified that both self-control and sex significantly influence the likelihood of engaging in both traditional and cyber delinquency, with boys being more prone to delinquent behaviour, especially online. These findings suggest that enhancing self-control is crucial in reducing delinquency while highlighting that self-control is more influential in offline offences than online. Thus, further research is needed to identify predictors specific to cybercrime to develop differentiated approaches to address offline and online delinquency. Overall, the study underscores the necessity for targeted interventions that consider educational environments, gender differences, and the unique characteristics of different forms of delinquency.

Keywords: delinquency; cybercrime; self-control; adolescents; ISRD-4

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List of Abbreviations

ANOVA	Analysis of Variance
APA	American Psychological Association
ČSÚ	Český Statistický Úřad (Czech Statistical Office)
FBI	Federal Bureau of Investigation
GTC	General Theory of Crime
ICT	Information and Communication Technology
ISRД	International Self-Report Delinquency Study
LRT	Likelihood Ratio Test
MŠMT	Ministerstvo školství, mládeže a tělovýchovy (<i>Ministry of Education, Youth, and Sports</i>)
NASEM	National Academics of Sciences, Engineering, and Medicine
SCT	Social Control Theory
WEF	World Economics Forum

Introduction

Juvenile delinquency represents a globally alarming topic, especially in the post-pandemic world. The COVID-19 pandemic has significantly impacted the crime dynamics, especially due to isolation and the applied restrictions, leading to an increase in theft and violent crimes among adolescents (Nägel & Kroneberg, 2023). Germany has, for example, observed an increase in juvenile suspects by almost 10% between 2023 and 2024 (Bundeskriminalamt, 2024). Furthermore, a study by Revital and Haviv (2022) suggest a significant shift towards cybercrime during the pandemic, indicating a change in the dynamics of juvenile delinquency.

Despite these observed global trends, the impact of self-control, one of the strongest predictors of delinquency (Prat & Cullen, 2000), remain sparsely researched within the current Czech context. Since the traditional models of delinquency might not fully apply to the cyberspace, there is a need for investigation of potential differences in the impact of self-control. Thus, this thesis aims to bridge this literature gap by using data from the 4th wave of the International Self-Report Delinquency Study (ISR4), the largest cross-sectional study of juvenile delinquency in the Czech Republic. The influence of self-control on both offline and online delinquency will be analysed and subsequently compared. Additionally, given the inconsistent findings in the existing body of research regarding sex differences in the relationship between self-control and delinquency, this thesis also examines the potential gender disparity within the Czech context. Furthermore, this thesis investigates the role of different types of Czech educational institutions on self-control levels as well as their impact on juvenile delinquency.

The literature review of this thesis is divided into two main chapters. The first chapter defines and explores juvenile delinquency, detailing its various forms, with a special emphasis on cybercrime. It also outlines two major criminological theories related to self-control. The second chapter delves into self-control in the context of juvenile delinquency, introducing and discussing the current research in the development of self-control, sex differences, and its stability and dimensions. Additionally, its specifics within cybercrime are detailed. In the empirical part of the thesis, the research goals and the methodology are presented, followed by the analyses results and a thorough discussion.

The APA (2020) guidelines are followed throughout this thesis.

I. Literature Review

The literature review of this thesis brings a comprehensive summary of the multifaceted aspects of juvenile delinquency and one of its strongest known predictors – self-control.

In the first chapter, the term juvenile delinquency is operationalised and its various forms are categorized and further introduced. The focus then shifts to the emerging issue of cybercrime, exploring its triggers among youth and the dynamics of the victim-offender overlap. Theoretical frameworks underpinning the role of self-control in explaining juvenile delinquency are introduced, namely the Social Control Theory by Travis Hirschi (1969) and the General Theory of Crime by Travis Hirschi and Michael Gottfredson (1990).

Drawing upon this theoretical foundation, the second chapter of the literature review delves into the concept of self-control in the context of juvenile delinquency. Firstly, the development of the construct is examined by discussing the parental as well as social factors, sex differences, its malleability, and dimensions. The nuances of self-control within the context of cybercrime are introduced, providing insights into the current state of research in the digital realm and its specifics.

1. Juvenile Delinquency

For the purpose of this thesis, it is essential to operationalise the term *juvenile delinquency*. Firstly, it is important to define the age range that is considered when terms such as *youth*, *juvenile*, *children*, and *adolescents* are used. The definition varies significantly across different jurisdictions and contexts, and hence it is pivotal to establish the age range within the study at hand. Secondly, the significance of adolescence as a critical and formative period in life is emphasized, further delineating the chosen target group. Finally, the term *juvenile delinquency* is described and operationalised, followed by the introduction of different types of delinquency relevant to the study at hand and by chosen theories of delinquency.

In general, the term *juvenile* is applied to individuals who are under the age of 18, aligning with the United Nations Convention on the Rights of the Child, which defines a child as “every human being below the age of eighteen unless the age of majority is attained earlier under national legislation” (United Nations General Assembly, 1989, article 1, p. 2). Furthermore, the World Health Organization (n.d.) defines an *adolescent* as an individual in the second decade of life, falling within the age range of 10 to 19 years. For the scope of this thesis, the terms *youth*, *juvenile*, *children*, and *adolescents* will be used interchangeably to refer specifically to the group targeted in the International Self-Report Delinquency Study (ISRD), which is 12 to 21 years¹. This age bracket encompasses students in the last two years of primary education and the first two years of secondary education according to the age structure within the educational system established in the Czech Republic.

Adolescence marks the transition from childhood to adulthood and hence is one of the most formative periods in life. This translates into both major biological and psychosocial changes, that modify young person’s perception of themselves and that contribute to the development of one’s self-concept (Harter, 2012; Sebastian et al., 2008). During self-concept development and identity formation, adolescents tend to seek new experiences, experiment, and engage in risky behaviours (Gardner & Steinberg, 2005; NASEM, 2020). Although a certain amount of risk-taking behaviour is part of normative neurodevelopment, at the same time adolescents are more prone to engage in unhealthy risky behaviours, such as alcohol consumption or drug use (Bjork & Pardini, 2015; Duell & Steinberg, 2018; NASEM, 2020). Based on the Dual System Theory, increased risk-taking can partially be explained by a combination of immature self-control and

¹ The broad age range is further discussed in the empirical part of this thesis.

heightened reward sensitivity (Murray et al., 2021; Somerville et al., 2010; Strang et al., 2013). Albert and colleagues (2013) found that adolescents' responsiveness to the potential rewards of risky behaviours is particularly heightened by peer-related stimuli, meaning that spending time with peers can also lead to an increased tendency toward risky behaviour. Engagement in these unhealthy risky behaviours can often lead to misconduct that may potentially pose a threat to adolescents themselves or others and furthermore, that may result in juvenile delinquency (NASEM, 2020; van der Laan et al., 2015).

The term *juvenile delinquency* refers to offences committed by young individuals, encompassing both serious crimes as well as noncriminal misconduct (Shoemaker, 2017; Válková et al., 2019). To fully grasp the scope of juvenile delinquency, it's pivotal to recognize that the term does not solely refer to outright criminal acts. Instead, it also covers a spectrum of behaviours that, while not classified as crimes, are prohibited specifically because the individuals involved are minors. These particular behaviours are called *status offences* (Shoemaker, 2017). Status-offending behaviours are uniquely forbidden to minors only and would not be considered illegal if performed by an adult. It includes for example truancy, underage substance use, or running away from home. Engaging in such behaviours may carry significant consequences, including health risks as well as potential impact on future opportunities, and may disrupt the relationship with societal norms and expectations (Shoemaker, 2017).

In summary, juvenile delinquency manifests in various forms. Those can be classified in many different ways. For the purpose of this thesis, the classification from the ISRD questionnaire will be employed, and the selected types of delinquency will be further elaborated upon on the following pages.

1.1 Types of traditional Delinquency

1.1.1 Property crime

One of the globally most prevalent types of crime is *property crime*. This encompasses illegal activities such as theft, burglary, or shoplifting. For example, according to data from the annual crime report by the Police of the Czech Republic, there were 181 417 recorded crimes in 2023, of which 100 300 were classified as property crimes (Moravčík & Vinčálek, 2024). In Germany, there were 5,641,758 offences in total, of which almost two million were theft

offences (Bundeskriminalamt, 2024). Based on the Federal Bureau of Investigation (FBI)'s annual report of crime in the United States from 2022, there were 5,049,721 property crimes compared to 809,381 violent crimes (FBI, 2023). This evidence from various resources suggests that property crime constitutes a significant aspect of the global crime problem. A similar trend can be observed among adolescents – data from the ISRD studies consistently prove property crime, namely shoplifting, is the most prevalent crime among adolescents (Moravcová et al., 2015). Furthermore, a study from Austria conducted by Hirtenlehner and colleagues (2014) suggests that adolescents are the most prevalent shoplifters among all age groups.

De Buck and Pauwels (2018) utilized data from ISRD-3 to pinpoint the variables that most significantly influence the likelihood of intending to shoplift and identified pro-social moral norms, anticipated shame, and high self-control as the key protective factors. Based on Jack Katz's (1988) Seductions of Crime Theory, shoplifting can induce arousal, a temporary sense of control, and hypervigilance, which makes it especially appealing – seductive – to the risk-taking-inclined adolescents.

1.1.2 Violent crime

Violent crime, such as physical assault, murder, rape and sexual assault, or robbery, represents one of the most serious threats to public safety. Within the ISRD study, however, violent crime is comprised of group fights, weapon carry, robbery or threats, and physical assault, as these are perceived as common violent offences among the adolescent population.

Based on a meta-analytical review by Assink and colleagues (2015) some of the key risk factors include criminal history, aggressive behaviour, and alcohol or drug abuse. Furthermore, a review of empirical research conducted by Whiting et al. (2020) highlights a significant association between various mental health disorders and increased risks of violent behaviour. Individuals diagnosed with a mental health disorder are generally at higher relative risk of violent behaviour, with odds between 2-4 (after accounting for confounding factors). Violent crime rates are especially increased in people with schizophrenia spectrum disorders or personality disorders (6-10%) and substance misuse (over 10%). The likelihood of psychiatric morbidity is increased in children and adolescents with traumatic brain injury, as it impairs crucial neurological functions for social conduct and self-control (Williams et al., 2018). Additionally, Whiting et al. (2020) pointed out past criminal behaviour and concurrent substance misuse as strong predictors of future violent behaviour across many disorders,

supporting the findings from Assink et al. (2015). This evidence underscores the importance of violence risk assessment in psychiatric patients as a part of targeted prevention. Nevertheless, aside from mental health illnesses, there are other significant risk factors contributing to an increased risk of committing a violent crime. These are particularly rooted in childhood and adolescence.

Kalvin & Bierman (2017) found that emotional dysregulation and social isolation in adolescence are strong predictors of violent crime. Furthermore, a longitudinal study by Pardini et al. (2018) found that children exhibiting interpersonal callousness are more likely to engage in chronic and violent offences in adulthood. In contrast, anxiety issues in childhood reduced the likelihood of engaging in criminal activities (Hopfer, 2018; Pardini et al., 2018).

An extensive amount of research suggests that there is a strong correlation between child maltreatment and violent juvenile delinquency (e.g., Allwood & Widom, 2013; Fitton et al., 2018; Herrenkohl et al., 2020; Malvaso et al., 2018). According to Wert et al. (2017), the impact of maltreatment is especially pronounced in neglected children who are at higher risk of engaging in aggressive and criminal behaviour in adolescence. Concurrently, researchers have identified key protective factors that may mitigate these risks. For instance, resilience and self-control have been proven to play crucial roles in breaking the cycle of violence, suggesting that strengthening these qualities in maltreated children may be, above all, an effective strategy for reducing the likelihood of future violent offences (Yule et al., 2019; Wright et al., 2016).

1.1.3 Other crimes

The term *other crimes* usually encompasses offences such as vandalism, drug dealing, obstructing the execution of an official decision, or endangering the upbringing of a child (ČSÚ, 2021). Concerning this category in terms of the ISRD study, it involves namely vandalism, drug dealing, and graffiti.

Research highlights some specific patterns of behaviour and personality traits among youth engaged in these crimes. For instance, alcohol consumption and impulsiveness are significant factors increasing the risk of engaging in vandalism and graffiti (Evans et al., 2021; Nordmarker et al., 2016). Furthermore, children who engage in vandalism, theft, and alcohol-drug use are also more likely to be physically violent (van Lier et al., 2009). On the other hand, previous experience with violence, such as physical attacks or sexual assaults, have been found to be a significant denominator among young drug dealers (Hayashi et al., 2016). This further extends

to a study by Docherty et al. (2020), that revealed a significant association between dealing drugs (especially hard drugs such as cocaine or heroin as opposed to marijuana) and the likelihood of carrying a gun. This evidence indicates a correlation between multiple forms of delinquent behaviour creating a vicious cycle of crime.

1.2 Cybercrime

Based on the Global Risks Report (WEF, 2023) *cybercrime* poses one of the top ten global risks both short-term and long-term, and continues to evolve alarmingly. It encompasses a broad spectrum of illegal activities conducted online with the use of digital devices or information technology. Moreover, many of the traditional types of crime, such as fraud, theft, or hate crime, may now be perpetrated online within borderless cyberspace, which significantly expands the threat of cybercrime (Donalds & Bryson, 2019; European Commission, n.d.; United Nations, n.d.).

In the context of juvenile delinquency studied in ISRD-4, cybercrime was represented namely by fraud, hacking, hate crime, and sharing of an intimate photo or video. For the majority of teenagers, the internet offers an escape from reality and a safe space to live a second, sometimes more desirable, life (Presdee, 2000; Wall, 2007). Due to the formative nature of the adolescence phase, the boundlessness that the internet offers can result in identity experimenting and explorative self-presentation which despite being potentially a beneficial tool to promote adolescent development, can also be a risk factor for transgression as it induces a certain level of identity disruption (Valkenburg et al., 2005; Valkenburg & Peter, 2008; Borca et al., 2015).

1.2.1 Triggers of cybercrime among adolescents

Teenagers who engage in cybercrime face particular difficulties since they often lack an understanding of the legal and moral implications of their online actions in contrast to their advanced digital fluency. Research suggests that young people are especially susceptible to engaging in cyber-related offences due to their heightened impulsivity, sensation-seeking, and inclination for risk-taking behaviour (Forrest et al., 2019; Goldsmith & Wall, 2019; Steinberg et al., 2008). This can result in activities that range from seemingly harmless pranks to more severe offences such as hateful comments or sharing inappropriate content, all of which carry potential legal consequences. The phenomenon of *digital drift* discussed by Goldsmith & Brewer (2015) captures how young people can gradually and almost accidentally find themselves engaging in criminal behaviour due to the persuasive, and often even manipulative,

nature of the internet that can lead to perceiving certain features and affordances as irresistible (Alter, 2017). This extends to transgressions called *cyborg crimes*, a specific type of cybercrime that involves the integration of actions by both a human being and a computer (van der Wagen & Pieters, 2015).

Goldsmith & Wall (2019) describe the seductive features and affordances of the internet, the *seductive swamp* as called by Vaidhyanathan (2011), that can mislead young people to cross the fine line between a prank and an offence. Cooper (2000) has already identified three significant affordances – *accessibility*, *affordability*, and *anonymity*. Goldsmith & Wall (2019) expanded the model to include four more seductive elements of the internet – *abundance*, *ambivalence*, *arousal*, and *asymmetry*.

Accessibility encompasses ease of use, a sense of mastery, and speed of access (Goldsmith & Wall, 2019). Internet can be accessed almost anywhere anytime thanks to growing internet coverage and portable devices such as smartphones or tablets. It is hence no surprise that it is already heavily integrated into young people's lives. This can, according to the well-established Routine Activity Theory by Cohen and Felson (1979), increase the risk of crime by providing opportunities and triggers for a variety of delinquent acts. Intense exposure to digital devices from a very young age leads to the development of a certain sense of proficiency and mastery, which adolescents often lack in other areas of life. This is often seen as rewarding, especially among gamers and hackers, and hence the engagement in online activities is further reinforced (Schaffer & Fang, 2018; Steinmetz, 2016). According to Wall (2017), hacking often has roots in gaming, during which a young person is gradually drawn from fairly playing towards cheating, learning some hacking strategies, and later on even potentially towards actual offences. Furthermore, a study by Hutchings and Chua (2016) shows that hackers are significantly more often males of a young age. On top of the ease of use and sense of mastery, the sensation-seeking and risk-taking nature of the adolescence period aligns closely with the fast-paced dynamics of the internet that encourages a certain level of disinhibition (Suler, 2004; Valkenburg & Piotrowski, 2017).

Affordability refers to the minimal or zero financial costs associated with internet usage, social media platforms, or written and visual materials. This extends to the widespread tendency of illegal downloading, i.e., copyright piracy – especially among young people, as most online content is free and the skill to pirate is easily acquired (Goldsmith & Wall, 2019).

As mentioned earlier, adolescents tend to use the internet as a tool to experiment with their identities and self-presentation. This is largely connected with a third significant affordance of the internet, *anonymity*. Research shows that anonymity is not only an important risk factor related to engagement in cyberbullying (Barlett, 2015; Barlett et al., 2016; Barlett & Helmstetter, 2017), but it also increases the bystander effect (Macaulay et al., 2020; You & Lee, 2019). Anonymity provides a feeling of being protected from criticism, judgement, punishment, and overall accountability for one's actions, and thus weakens moral judgement and self-control (Runions, 2013).

The next seductive feature of the internet described by Goldsmith & Wall (2019) is *abundance*, which is closely linked to affordability and accessibility. The amount of options, material, and information users of the internet are exposed to offers many tempting possibilities.

The *ambivalence* of the internet refers to its diverse and multifaceted content that influences young people in contradictory ways. The endless access to knowledge and information can become overwhelming and distracting. Furthermore, this ambivalent experience lowers our capability of self-control, personal standards, sense of reality, and self-reflection (Goldsmith & Wall, 2019; Rimer, 2017; Williams, 2018)

The engaging and diverse content of the internet does not only stimulate one's curiosity, but it can also induce both intellectual and physiological *arousal*, based on the nature of the content. For instance, sexual arousal has been linked to increased risk-taking behaviours and at the same time diminished perception of potential negative consequences, leading to a strong impact on one's decision-making (Ariely & Lowenstein, 2006; Skakoon-Sparling & Cramer, 2016). The ability to sustain a certain level of self-control in a state of arousal is especially worsened in adolescents already more prone to risk-taking behaviour, as they are more affected by arousal (Valkenburg & Piotrowski, 2017).

The last seductive feature according to Goldsmith and Wall (2019) is *asymmetry*. It refers to how internet technologies can take away control and predictability from the users, for example through incorporating personalized algorithms or infrastructure based on variable rewards (Finn, 2017; Schull, 2012).

In conclusion, these six affordances described by Goldsmith and Wall (2019) can trigger and promote cybercrime among young people, mainly due to the internet's ability to provide instant

gratification and hence reinforce the potential transgression. In summary, this evidence suggests a crucial role of self-control in the likelihood of engaging in cybercrime offences.

1.2.2 The victim-offender overlap

In examining the dynamics of cybercrime among young people, several studies (e.g., Burden, 2023; Kranenbarg et al., 2017; Marcum et al., 2014; Nodeland, 2020) have pointed out that there is a significant overlap in the victim and offender role and moreover, that cybercrime victimization is a significant predictor of cybercrime delinquency and vice versa (Burden, 2023). Furthermore, these studies also show that self-control is one of the strongest predictors of cyber offending as well as of victim-offending.

Research on cyberbullying in a Czech adolescent sample by Bayraktar and colleagues (2015) indicated discriminant factors between cyberbullies, cyberbully-victims, and cybervictims. The results revealed that cyberbully-victims and cyberbullies share similar characteristics, such as low self-control, low self-esteem, and a tendency to engage in offline aggression. Interestingly, cyberbullies who had also been victimized had higher scores on these measures than cyberbullies who had never experienced cyberbullying from the victim's perspective.

Exploration of the interplay between victimization and offending in cybercrime highlights the dependency of these roles among adolescents. The similarities between cyberbullies and cyberbully-victims, particularly in terms of self-control levels, underscore the complex web of influences triggering cybercriminal behaviour.

To gain a deeper understanding of the roots of juvenile delinquency in general, it is important to frame these outlined findings within a criminology-based theoretical framework.

1.3 Theories of juvenile delinquency

The previous chapters have underscored the multifaceted nature of delinquency among youth, influenced by various individual, social, and situational factors. To further explore these complexities, this chapter will delve into two classical theories of juvenile delinquency to better understand and address the underlying dynamics.

Criminology is an interdisciplinary field that combines insights from sociology, psychology, law, statistics, and anthropology to construct a better understanding of crime and criminal behaviour (Newburn, 2018). Therefore, many criminology theories seek to explain juvenile

delinquency from different perspectives, each offering distinct opinion based on its foundational discipline. In this chapter, two of the key criminology theories in understanding the complexity of juvenile delinquency are introduced. Given the field and focus of the thesis at hand, theories from the sociological and psychological domains are introduced, with an emphasis on the theories that underscore the critical role of self-control.

1.3.1 Social Control Theory (Hirschi, 1969)

The Social Control Theory (SCT), also referred to as Social Bond Theory or Bonding Theory, was first introduced by Travis Hirschi in 1969 in the book *Causes of Delinquency*. The theory focuses on ways in which social bonds may influence the likelihood of individuals engaging in delinquent or criminal acts. It suggests that social bonds, such as relationships, commitments, values, and norms induce a certain level of self-control over life and hence serve as a protective factor from committing a crime. In other words, the strength of these social bonds determines whether a person will behave prosocially or antisocially. Based on the SCT, criminal behaviour is a result of a breakdown in one or more of these societal bonds (Hirschi, 1969).

Hirschi (1969) identified four main interrelated elements influencing one's bond with society, and hence preventing one from engaging in criminal behaviour. These elements are:

1. Attachment,
2. Commitment,
3. Involvement,
4. and Belief.

In Hirschi's (1969) perspective, *attachment* refers to the extent of psychological affiliation one holds towards important others and institutions. In other words, the emotional connections that young individuals establish during adolescence with positive social figures and institutions are crucial for enhancing social control. Such bonds, particularly with one's parents and school, play a significant role in fostering a sense of responsibility and adherence to societal norms (Stewart, 2003). Although these connections do not guarantee the prevention of all delinquent acts, they underscore the concept that the desire not to disappoint respected and important others can significantly influence one's decision-making processes and consequently their actions.

The second type of social bond identified by Hirschi (1969) is *commitment*. This factor suggests that individuals are less inclined to engage in crime when they recognize the substantial losses

that could result from such actions. People tend to weigh the benefits of committing a crime against the potential costs of it – such as the loss of property, freedom, and the jeopardization of personal achievements and goals. For adolescents, this specifically includes personal relationships with peers, parents, and teachers, and above all, academic achievements. Poor academic performance has been found as one of the strongest correlates with juvenile delinquency (Felson & Staff, 2006; Maguin & Loeber, 1996; Ragnarsdottir et al., 2017; Yun et al., 2015). Thus, based on Hirschi's theory, higher academic achievement signifies greater potential loss, thereby reducing the propensity for criminal activity and serving as a protective factor.

The concept of *involvement*, as the third type of social bond in Hirschi's framework (1969), refers to the opportunity costs associated with how people spend their free time. It underscores the protective effect of engaging in conventional prosocial activities, such as academic, athletic, or social school-related activities, after-school jobs, or volunteering. Moreover, adolescents engaging in these conventional activities have less time to engage in criminal behaviour. On top of that, thanks to their involvement in these activities, they are less likely to encounter opportunities for crime or to be influenced by delinquent peers (Hoeben & Weerman, 2016).

Finally, according to Hirschi (1969), the fourth element of social bonds is *belief*. This factor addresses the extent to which individuals value and internalize laws, rules, and regulations. Based on this assumption, an individual with a strong belief in the moral validity of societal rules is less likely to engage in criminal or delinquent behaviour.

The empirical research on the efficacy of Hirschi's SCT has been extensive over the years. For example, Junger-Tas (1992) conducted a large cross-sectional study on a random sample of 2000 adolescents in the Netherlands. Among other findings, the results of this study suggested that SCT represents a major contribution to understanding juvenile delinquency. Similarly, Özbay & Özcan (2006) arrived at the same conclusion in a study on high school students in Turkey. Another study demonstrated that two of the social bond elements, attachment and involvement, play a significant role in the ethical rule-breaking of employees (Sims, 2002). On a similar note, Donner and colleagues (2016) found a relationship between police misconduct and SCT. On the other hand, a longitudinal test of SCT revealed that social control variables explained only 1%-2% of the variance in future delinquency (Agnew, 1985). This result suggested that the efficacy of Hirschi's theory might have been overestimated in the previous cross-sectional studies.

In the later stages of Hirschi's career, he has himself shifted towards the Self-Control Theory (Gottfredson & Hirschi, 1990), which will be further discussed in the following chapter. Nevertheless, as an important contribution to criminology, the legacy of SCT remains to be a topic of academic reviews (e.g., Costello & Laub, 2020) as well as a focus of master theses and doctoral dissertations (e.g., Ford, 2017). Nevertheless, Gottfredson and Hirschi (2019) stated themselves that the Social-Control Theory and Self-Control Theory are built upon basically the same premises and hence they blur together.

1.3.2 Self-Control Theory (Gottfredson & Hirschi, 1990)

Michael Gottfredson and Travis Hirschi introduced the Self-Control Theory, often also referred to as the General Theory of Crime (GTC), in 1990. The initial aim was to develop a universal theory applicable to any criminal or analogous behaviour across different age groups and cultures – a general theory of crime. In order to do so, they have integrated aspects from several criminology theories and findings, such as mainly Hirschi's Social Control Theory, but also Routine Activity Theory by Cohen & Felson (1979), and principles from criminology classics C. Beccaria, J. Bentham, and later C. Lombroso.

Since the concept of GTC was introduced, it has been subjected to a substantial amount of research and publications over the years, such as Goode (2008), Hay & Meldrum (2016), and various meta-analyses (e.g., Pratt & Cullen 2000; Vazsonyi et al. 2017), all pointing out its high efficacy. Furthermore, Gottfredson and Hirschi themselves have recently published a book "*Modern Control Theory and the Limits of Criminal Justice*" (2019). In this book, they seek to address some of the criticism of GTC, offer a critical opinion on some of the recent theories and research, specify and correct some ambiguities of their earlier work, and contribute to the development of a theory-based public policy.

The GTC is based on the premise that the absence of self-control is the key aspect of any criminal or analogous behaviour, which occurs due to the perpetrator's tendency to prefer immediate gratification over considering potential long-term consequences (Gottfredson & Hirschi, 1990). On the contrary, individuals with high levels of self-control are significantly less prone to any criminal or analogous behaviour. As later clarified by Gottfredson and Hirschi (2019), having low self-control is, however, not a propensity to engage in criminal behaviour, but rather a tendency to overlook the negative consequences of such acts.

They believed that self-control is a factor that manifests itself across various aspects of life and has the power to disrupt relationships, well-being, and long-term goals. Thus, Gottfredson and Hirschi (1990, p.15) defined crime as “acts of force or fraud undertaken in the pursuit of self-interest”. Additionally, Gottfredson & Hirschi (1990) identified six personality traits attributed to lack of self-control: inability to delay gratification, preference for physical rather than mental activities, risk-taking behaviour, insensitivity, short-sightedness, and low frustration tolerance. They claim that self-control tends to be rather stable across the lifespan as it is mostly shaped in early childhood through socialization processes and social learning. Thus, it is important to be mindful of its impact in order to prevent juvenile delinquency and other potential criminal behaviour in the future. Based on their framework, the lack of self-control is mainly caused by an inadequate child-rearing environment that is missing nurturance, discipline, or training. Gottfredson & Hirschi (1990) described three crucial parenting practices necessary to provide a stable child-rearing environment that can foster the development of self-control: 1) supervise children’s behaviour, 2) recognize delinquent behaviour, and 3) punish such behaviour. They especially stress the importance of attachment, supervision, and discipline in the process.

The concept of self-control, its psychological and developmental aspects as well as its connection to juvenile delinquency, will be further elaborated in the following chapter.

2. Self-Control in the Context of Juvenile Delinquency

The American Psychological Association (2018) defines self-control as “The ability to be in command of one’s behaviour (...) and to restrain or inhibit one’s impulses. In circumstances in which short-term gain is pitted against long-term greater gain, self-control is the ability to opt for the long-term outcome.” Duckworth & Steinberg (2015) distinguished between cognitive processes that can either facilitate or undermine self-controlled behaviour. In general, wilful and intentional actions, including executive functions, planning, focusing, and the ability to maintain psychological distance, all contribute to self-controlled behaviour. On the other hand, impulsiveness together with sensation seeking, reward sensitivity, and particular cravings can compromise self-controlled behaviour.

Pratt and Cullen (2000, p. 952) have already established self-control as “one of the strongest known correlates of crime”. On the contrary, high levels of self-control can serve as a protective factor from engaging in transgression and are hence a potential focal point for interventions. For instance, higher levels of self-control in the adolescent population have been found to correlate with better academic achievements (Duckworth et al., 2019; Galla & Duckworth, 2015; Tagney et al., 2018), lower alcohol and drug abuse (Geurts et al., 2023; Osgood & Muraven, 2017; Tagney et al., 2018), lower risky sexual behaviour (Knowles et al., 2019; Magnusson et al., 2019; Vazsonyi et al., 2006), less emotional and behavioural problems and more prosocial behaviour (King & Gaerlan, 2014; Li et al., 2022; Situ et al., 2015; Paschke et al., 2016), and with overall better well-being (Converse et al., 2018; Ronen et al., 2016; Wenzel et al., 2020;). All of the above contribute to the effectiveness of self-control as a protective factor from delinquent behaviour. Nevertheless, the development of self-control is subjected to many individual, biological, as well as environmental factors resulting in some teenagers possessing better self-control skills than others.

This theoretical foundation, together with the crime theories framework, raises important questions, such as “How is self-control developed and how can it be promoted?”, “What are the implications in current research?”, and “How are current studies building on this understanding to develop more nuanced perspectives on crime prevention and intervention?”.

Therefore, this chapter aims to explore the developmental and psychological aspects of self-control and its pivotal role in influencing adolescents’ decision-making processes and their potential delinquent outcomes. Attention is further paid to the ongoing debate around the stability and dimensionality of self-control as well as sex differences and similarities in the

development and impact of self-control. Moreover, recent findings on how self-control directly and indirectly impacts youth crime – both in terms of traditional delinquency and in cybercrime specifically – are discussed.

2.1 Development of self-control

The development of self-control is influenced by both psychosocial as well as biological factors. A recent meta-analysis by Willems et al. (2019) showed that the overall heritability of self-control is around 60% in both boys and girls. The rest can be attributed to environmental influences.

Research highlights the roles of both primary and secondary socialization processes, i.e., family, school, and peers, in the impact on one's development of self-control (e.g., Hay & Forrest, 2006; Meinert & Reinecke, 2017; Meldrum et al., 2012).

2.1.1 Parental and social influences

Recent research has shown that improved self-control is largely associated with positive parenting practices, such as consistency, warmth and support, and authoritative parenting style as well as with a solid parent-child bond and secure attachment. In comparison, unhealthy attachment together with harsh parenting practices like physical punishments, inconsistency, coerciveness, and authoritarian parenting style are linked to lower self-control in children (Davis et al., 2017; Palini et al., 2018).

This observed parental influence might decrease during adolescence as teenagers tend to seek autonomy from parents (Hay & Meldrum, 2016; Tiberio et al., 2016). However, a recent meta-analysis by Li and colleagues (2019) proves that parents remain significant figures and continue to influence adolescents' self-control both concurrently and longitudinally.

With the newly discovered relative autonomy, adolescents tend to spend more time with peers and choose activities based on their own discretion. Thus, secondary socialization processes, i.e., peers (Meldrum, 2008; Meldrum et al., 2012), neighbourhood (Gibson et al., 2009; Teasdale & Silver, 2009), or school (Meldrum et al., 2012; Turner et al., 2005), also have a strong impact on the development of self-control during adolescence.

A meta-analysis conducted by Li et al. (2020) indicates that school environment plays a critical role in shaping self-control especially due to its structured discipline and established rules,

which foster the development of self-discipline and self-control. Furthermore, research by Beaver et al. (2008) highlights how various school and classroom characteristics can significantly influence self-control development. In line with this, a study by Turner et al. (2005) showed that the effect of school on self-control development varies depending on neighbourhood contexts, suggesting that a certain school type and location can distinctly shape self-control development among students. These findings highlight the importance of examining how different school facets and educational settings may contribute to the development of self-control in adolescents.

Besides school environment, studies show that there is a longitudinal reciprocal relationship between delinquent peer groups and low self-control (Stults et al., 2021; Huijsmans et al., 2019). Individuals with a preference for risk-seeking, immediate gratification, or risky activities tend to naturally sort themselves into groups together (Akers, 2009; Rees & Zimmerman, 2016). As a result, several studies have revealed a pathway to juvenile delinquency, where low self-control increases the probability of being part of a delinquent peer group, which consequently affects crime (Stults et al., 2021; Hay & Meldrum, 2015).

Furthermore, research suggests a significant connection between self-control and morality (Pauwels et al., 2018). Adolescents with more pronounced moral beliefs are better able to make thoughtful and reflective decisions (Timmer et al., 2023). This connection between morality and self-control is rooted already in Hirschi's (1969) SCT, specifically in one of the social bonds – *belief*. Building upon that, findings from some recent research indicate that the protective effect of high self-control levels against engaging in criminal behaviour is especially significant for adolescents who hold weaker moral beliefs (Ivert et al. 2018; Wikström and Svensson 2010). However, a study by Kammingan (2022) showed another interaction – morality can enhance the protective effect of self-control. Similarly, high self-control can hinder the effect of negative delinquent peer influence among adolescents with weak morality (Hirtenlehner, 2020).

2.1.2 Sex differences

Gottfredson and Hirschi (1990) hypothesised, that there is a significant gender gap in the level of self-control among adolescents. They argued, that compared to boys, girls are in general more likely to be corrected by their parents in case of any misbehaviour. Consequently, this increased parental supervision is expected to lead to a stronger sense of self-control among

girls, creating a notable disparity between the two sexes. Similarly, Hayslett-McCall and Bernard (2002) as well as Svensson (2003) pointed out that boys often create weaker emotional attachments with their mothers and that it contributes to the observed sex differences in self-control levels. A study by Turner and Piquero (2002) supported the hypothesis of Gottfredson and Hirschi by revealing significantly lower levels of self-control in boys compared to girls and Wong et al. (2010) have also found a stronger connection between self-control and delinquency among boys who may be more prone to seek risky and provocative situations. For example, Stults et al. (2021) found that boys are significantly more influenced by low levels of self-control as well as by delinquent peers when it comes to violent and property crime, compared to girls. Some of the former studies also suggest that boys are more susceptible to delinquent peer influence than girls in general (e.g., Mears et al., 1998).

Nevertheless, some of the recent research suggest a different direction. Several studies proved that there are no significant differences in the trajectory of self-control development between boys and girls (Jo & Bouffard, 2014; Jo & Armstrong, 2016; Thijs et al., 2015) and moreover, that self-control explains crime behaviour in both sexes equally (Baek et al., 2018; Blackwell & Piquero, 2005).

In conclusion, the discussion about sex differences in the development of self-control and its influence on juvenile delinquency remains open, as the results are inconsistent.

2.1.3 Stability of self-control

Gottfredson and Hirschi (1990) argued that self-control is a unidimensional construct that stays rather stable across the lifespan and that stabilizes in the first decade of life. Additionally, they posited that early childhood is pivotal in determining the direction of its future stabilization. Nevertheless, numerous researchers have questioned this statement about the early and definitive stabilization of self-control and several recent longitudinal studies have even revealed that self-control might change over time, especially during the adolescence period (e.g., Burt et al., 2014; Hay & Forrest, 2006; Forrest et al., 2019; Jo & Armstrong, 2018; Meldrum et al., 2012; Pratt, 2015; Zondervan-Zwijnenburg et al., 2020).

The Self-Regulatory Strength Model introduced by Baumeister and colleagues (2006) compares self-control training to muscle exercise, emphasising its potential to be depleted, yet also strengthened and enhanced through consistent practice. In addition, Beaver and colleagues (2013) found that both stability and change in self-control levels during adolescence can be

mostly explained by genetic factors, with the rest being subjected to parental and social influences. This shows that self-control is to some extent malleable, which does not only shed light on its developmental aspects but also underscores the importance of implementing interventions that focus on self-control training not only for children but also for adolescents. On top of that, it suggests the need to involve parents and peers in these interventions to enhance their effectiveness.

2.1.4 Dimensions of self-control

Apart from questioning the stability of self-control, scholars have also explored its dimensionality, revealing multiple dimensions of self-control that may vary in development and stability. For instance, Steinberg and colleagues (2008) introduced the dual systems model of neurobiological development. The model indicates that self-control is composed of two dimensions – risk-seeking and impulsivity. According to Steinberg et al. (2008), these two components differ in their neurological foundation as well as their manifestation as they are subjected to puberty-related biological processes. Thus, whereas risk-seeking tendencies naturally increase in early adolescence, impulsiveness gradually decreases throughout the teenage years.

Furthermore, research by Burt et al. (2014) shows that fluctuations in sensation-seeking and impulsivity correspond closely with changes in delinquent behaviour, with each trait having a distinct impact on criminal activity. Forrest et al. (2019) conducted a study to examine the dual system model. The results supported the proposed multidimensional conception of self-control. However, they have also found that the relationship between the two components and criminal behaviour is dynamic, and the effect is influenced by other developmental factors as well. These findings highlight the importance of understanding self-control as a multidimensional dynamic construct in the context of juvenile delinquency.

2.2 Specifics within cybercrime

The relationship between self-control and traditional juvenile delinquency is well established – as proved by the evidence provided earlier in this chapter. Yet, it raises some questions: Does this trend extend to the cyber realm? Is the same level of self-control required to prevent engagement in cyber transgressions, or is cybercrime less influenced by self-control? Given the increasing global concern over online criminal activities among youth, this chapter seeks to explore the current research on self-control within the context of cybercrime.

Research on the relationship between cybercrime and self-control has been growing in the past years. Several studies have shown that low self-control is a significant correlate of different types of cybercrime, such as hacking or cyberbullying (e.g., Holt et al., 2020; Maimon & Louderback, 2019). Furthermore, results from a study by Macrum and colleagues (2014) reveal that both girls and boys with low levels of self-control are equally more prone to engage in cyberbullying, i.e., online hate crime, suggesting no differences in the influence of self-control between the two sexes.

Evidence from research suggests significant interactions between self-control and other factors. For instance, Holt and colleagues (2020) identified that opportunity serves as a mediator in the relationship between self-control and juvenile hacking. Similarly, another study by Holt and colleagues (2021) found that both low self-control, as well as opportunity measures, correlate with engagement in sexting behaviours and sext dissemination among youth. Additionally, they have also found that the relationship between self-control and sexting was mediated by opportunity factors. Another significant mediator that has been found in this relationship is the influence of delinquent peer groups (Marcum et al., 2014; Stalans & Donner, 2018). Delinquent peer association did not only mediate the relationship, but it was also found to aggravate the effect of self-control on cyber transgression (Holt et al., 2010). Stalans and Donner (2018) have also pointed out that the relationship is further mediated by disrupted moral beliefs.

The presented findings are in line with both the juvenile delinquency theories, as well as with the current state of research in the context of offline delinquency. Nevertheless, research examining the impact of low self-control on cybercrime among diverse juvenile populations remains limited as most of the studies were conducted on samples in the United States (e.g., Macrum et al., 2014) or Australia (Holt et al., 2020; Holt et al., 2021). This highlights a significant gap in the literature, particularly concerning European contexts, as the adolescent population may exhibit different behavioural dynamics within cybercrime.

II. Empirical Part

Despite the considerable body of research on the role of self-control in juvenile delinquency, most of the studies were carried out outside of the Czech Republic. Data from ISRD-4 provide a substantial representative sample of Czech adolescents, marking it as the largest and most recognized cross-sectional study of juvenile delinquency within the Czech Republic. Since the previous wave was conducted between 2012 and 2014 (Marshall et al., 2013), this current study provides unique insights into the latest trends of juvenile delinquency and its correlates.

Research on sex differences provides inconsistent findings. Some studies indicate there is a significant difference in the relationship between self-control and delinquency between boys and girls whereas some researchers suggest there is none. Moreover, research focusing on the potential influence of different school types on self-control levels is very sparse. In fact, there is no such research done in the Czech context that would take into account its established school system. Thus, analyses included in this thesis can provide valuable insights into the potentially significant impact of school type choices on the development of individual levels of self-control.

Furthermore, there is a notable gap in understanding the role of self-control in cybercrime compared to traditional offline delinquency. This gap is especially pronounced in the Czech context, where no specific research has yet explored how self-control impacts cybercrime versus traditional delinquency among adolescents. Therefore, the findings from this project provide a fresh perspective on the current trends of juvenile delinquency and self-control within the Czech setting. Moreover, the study at hand addresses the important, yet understudied, relationship between self-control and cybercrime – a very specific type of juvenile delinquency, to which traditional models may not fully apply in our cultural context. Comparison of the self-control influence on offline and online offences may bring valuable insights into the differentiation of these two realms and hence contribute to implementing more crime-specific effective interventions. Additionally, the exploration of potential sex differences in the relationship as well as the impact of school type or sex on self-control levels offers a more nuanced understanding of these dynamics, which is essential for understanding the issue and subsequently developing targeted interventions tailored to the specific needs of Czech adolescents.

The empirical part of this thesis is structured into four main parts. Firstly, the *research goals* are established along with relevant research questions and hypotheses; secondly, participants,

measures, procedure, statistical analyses, and research ethics are detailed in the *methods* section; thirdly, the statistical outcomes are presented in the *results* section; and lastly, the *discussion* offers an interpretation of the findings, along with a critical evaluation of the study's limitations as well as implications for future research.

3. Research Goals

Drawing from theoretical frameworks and empirical findings outlined in the literature review, the purpose of this thesis is to investigate the impact of low self-control on juvenile delinquency among Czech youth and moreover, to investigate the potential differences in its influence on offline and online offences. Additionally, given the contradictive findings from previous studies, this project will explore the potential sex differences in the impact of self-control on juvenile delinquency. It will also investigate how sex and school type may affect levels of self-control in the first place.

3.1 Research questions and hypotheses

Based on the above, the following research questions and hypotheses were formulated²:

Research Question 1 (RQ1): Does sex and school type influence the level of self-control in adolescents?

a) Main effect of sex:

- **H1A:** There is a significant difference in the level of self-control between teenage boys and girls (e.g., Gottfredson & Hirschi, 1990).

b) Main effect of school type:

- **H1B:** There is a significant difference in the level of self-control among the different school types (e.g., Li et al., 2020).

c) Interaction effect:³

- **H1C:** There is a significant interaction effect between sex and school type on the level of self-control.

² Null hypotheses indicate no relationship between the variables in all cases, and hence only alternative hypotheses are listed.

³ Sex and school type.

Research Question 2 (RQ2): Is there a significant relationship between self-control and delinquency among adolescents?

- **H2:** There is a significant negative correlation between self-control and delinquency among adolescents, i.e., $r < 0$ (e.g., Moravcová et al., 2015; Vaszonyi et al., 2017).

Research Question 3 (RQ3): Are there significant differences between boys and girls in the effect of self-control on juvenile delinquency?

- **H3:** The correlation strength of self-control on juvenile delinquency does significantly differ between boys and girls, i.e., $r_{\text{boys}} \neq r_{\text{girls}}$ (Stults et al., 2021; Wong et al., 2010).

Research Question 4 (RQ4): Is the predictive power of self-control on cybercrime distinct from its predictive power on traditional delinquency among Czech adolescents (while controlling for sex and school type)?

a) Model 1 (Traditional Delinquency)

- **H4A:** Self-control significantly predicts traditional delinquency among adolescents, i.e., $\beta \neq 0$ (e.g., Vaszonyi et al., 2017).

b) Model 2 (Cybercrime)

- **H4B:** Self-control significantly predicts cybercrime among adolescents, i.e., $\beta \neq 0$ (Holt et al., 2020; Maimon & Louderback, 2019).

As there is no statistical way to compare two non-nested logistic regression models, the comparison of the results will be elaborated in the discussion section, which will seek to answer this research question based on the results of the prior analyses.

4. Methods

4.1 Participants

The study comprised a total of 2126 participants, of which 11 were excluded due to missing sex data in order to ensure the integrity of further comparative analyses between male and female participants. This resulted in a final sample of 2115 individuals, with 997 boys (47%) and 1118 girls (53%). Participants' age ranged from 12 to 21 years ($M = 15.43$, $SD = 1.32$), with the majority of participants aged between 14-17 (91% of the sample). There were two missing age values in the dataset, which were, however, not excluded as they were not essential for the analyses.

The data included participants from two Czech cities – Prague ($N = 985$, 47%) and Pilsen ($N = 1130$, 53%). Students from five different school types were represented: primary school (*základní škola*), multi-year grammar school (*víceleté gymnázium*), four-year grammar school (*čtyřleté gymnázium*), vocational programme (*učební obor*), and “maturita” programme concluded with school leaving examination (*maturitní obor*). Most participants were attending primary schools ($N = 824$, 39%) and “maturita” programmes ($N = 620$, 29%). The least represented school type was a four-year grammar school with 154 participants (7%).

Participants were drawn from four different grades: 8th and 9th grades of primary schools (and their equivalent in multi-year grammar schools), and the first and second years of high school⁴ students. The participants were almost equally distributed across these four grades, with each grade comprising 24 – 27% of the children from the various school types in Prague and Pilsen. Besides attending one of the selected school types within the designated grades, there were no other inclusion criteria.

An overview table of the participants' characteristics can be found in Table A1 in Appendix A.

4.2 Measures

The data used in this thesis come from an International Self-Report Delinquency Study (ISRD-4) conducted in over 50 countries during the years 2020-2023. The questionnaire was translated

⁴ Term *high school* in the Czech context encompasses the following: grammar schools, vocational programmes, and „maturita“ programmes.

to Czech, Ukrainian, and Russian in order to collect data in the Czech Republic. For the Czech translation of all items from the questionnaire relevant for this study, see Appendix B.

For the purpose of this study, only data collected in the Czech Republic are used, which were collected in the first half of 2023. ISRD first took place in 1992, with the Czech Republic first joining the second wave in 2007 and completing the third wave ISRD-3 in 2014. ISRD-4 is a standardized internet-based self-report questionnaire aiming to explore adolescents' experiences with delinquency and victimization. Furthermore, ISRD-4 sought to investigate the potential contributing factors, both individual as well as social, such as:

- family;
- school;
- friends;
- neighbourhood;
- free time;
- social groups belonging;
- social media usage;
- perceived police efficiency;
- a general attitude towards crime;
- prosociality;
- feelings of shame and revenge;
- and self-control.

In the study at hand, there are three main variables of interest – traditional (in-person) delinquency, cybercrime, and self-control. Additionally, the effects of sex and school type are explored. Table 1 provides an overview of the forms of all juvenile delinquent acts targeted in the questionnaire (see Appendix B for the corresponding items). In contrast to the previous ISRD studies, ISRD-4 was the first wave to include cybercrime.

Traditional delinquency will be assessed based on the occurrence of two or more instances of any type of delinquent behaviour, except for cybercrime, in the past twelve months. Cybercrime will be operationalised respectively – engagement in two or more instances of cybercrime acts in the past year (see overview in Table 1). Information about recoding and transformation of the variables is further elaborated in the results section of this thesis.

Table 1*Overview of delinquent acts in the ISRD-4*

Type	Form of Delinquency
Property Crime	shoplifting car/motorcycle theft burglary
Violent Crime	group fight carrying a weapon robbery/threat physical assault
Other	graffiti vandalism drug selling
Cybercrime	sharing an intimate photo or video hate crime (messages, comments) fraud (illegal sales, phishing...) hacking

The self-control variable was assessed within the ISRD-4 questionnaire using a modified version of Grasmick et al.'s (1993) established self-control measure. To maintain a reasonable length of the questionnaire, the original scale was reduced to only include two out of six dimensions – impulsivity and risk-taking – each represented by three items. Participants were asked to evaluate those six statements on a five-point Likert scale. This included statements such as: “I act on the spur of the moment without stopping to think” or “Excitement and adventure are more important to me than security”. See Appendix C for all items in the modified scale.

In further analyses, two of the gathered demographic variables will be used – sex and school type. Male and female participants will be compared in some of the analyses. Data regarding the type of school attended by each of the participants were gathered during the sampling procedure, which is further detailed in the following chapter.

4.3 Procedure

The ISRD study employed a random sampling method, with the sampling frame comprising a list of schools and classes (in Prague and Pilsen) provided by the Ministry of Education, Youth, and Sports (MŠMT). From this, a list of randomly ordered classes from schools of the targeted types was generated to achieve a specified number of participants per grade. The minimum

required sample size in total was 1800 participants. The choice of cities was based on the previous waves ISRD-2 and ISRD-3 that were also conducted in Prague and Pilsen, to secure the comparability of data over time.

The initial step involved contacting the school principals via email. The message included an invitation letter (detailed in both Czech and English translation in Appendix D) and four supplementary documents:

- a comprehensive description of the research procedure from the main project investigators (Prof. Jiří Buriánek, CSc., and Mgr. Zuzana Podaná, Ph.D);
- a letter from the ISRD project's international steering committee;
- endorsements from the Prague Social Services Centre, the National Committee for Crime Prevention;
- and an expression of support from either the Prague City Hall's Department of Education, Youth, and Sports or from the Deputy Mayor for Education and the Head of the Department of Education, Youth, and Physical Education at Pilsen City Hall.

In cases where no response was received, follow-up contact was made via telephone. If the school principal directly refused participation or was repeatedly unreachable, an alternate school from the list was approached. The recruitment process continued until the required number of participating classes was reached (102 classes in total). A total of 185 schools were contacted in order to achieve the desired participation rate, which resulted in a response rate of approximately 55%. This reflects the level of engagement and willingness among the approached school principals to contribute to the research as well as the representativeness of the sample.

Upon confirmation of participation, arrangements were made with the class teacher for a suitable date. A trained examiner (usually a student from Charles University) visited the school on the agreed day, proceeding with the data collection in the school's computer lab. In line with ethical guidelines, informed consent was obtained from all participants or their guardians and the participation was voluntary. Detailed information on the consent process and other ethical considerations is provided in the *Research Ethics* chapter below.

First, the examiner introduced the study to both the class and the teacher and gave the necessary instructions. This first part took around 10-15 minutes. To maximize the sense of privacy, students completed the questionnaire individually on computers and the teacher was asked to

leave the classroom for the time of data collection. The students were advised to work individually without talking or looking into each other's computer screens. To ensure the rules were followed, the examiner stayed in the classroom to supervise the process. Each student received a link to the standardized online questionnaire (conducted in LimeSurvey) and a code unique for each class to ensure anonymization of the collected data. Completion of the questionnaire took approximately 30-45 minutes and was typically conducted during scheduled ICT lessons.

No direct rewards were provided to participants. However, contributing schools received a summary report with key findings of the research, and their representatives were invited to join a workshop discussing the project's outcomes.

4.4 Statistical analysis

Before diving into hypotheses testing, reliability of the self-control scale will be tested to secure the accuracy in measuring self-control, as some items were excluded in comparison to the previous ISRD waves. Cronbach's Alpha will be calculated in order to evaluate the internal consistency of the scale. If the Cronbach's Alpha value is above 0.7, the scale will be considered reliable, indicating that the items measure the same underlying construct. Furthermore, Cronbach's Alpha will also be calculated for each of the scale's dimensions separately in order to further verify the scale's internal consistency.

Firstly, to investigate the research question concerning the influence of sex and school type on the level of self-control in adolescents (RQ1), a factorial, two-way ANOVA will be conducted after checking for relevant assumptions. The main effect of sex (H1A), the main effect of school type (H1B), and the interaction effect between sex and school type (H1C) on self-control levels will be tested. Results showing a significant p-value (alpha level of .05) will demonstrate a statistically significant effect, thus supporting the alternative hypothesis. This applies to either of the main effects (sex or school type), as well as to the potential interaction effect between these two variables and levels of self-control.

Secondly, to address the hypothesis suggesting there is a negative relationship between self-control and delinquency in the Czech adolescent sample (RQ2), a correlational analysis will be performed. The alternative hypothesis (H2) will be supported in case a significant negative correlation between the two variables is found, i.e., the correlation coefficient is below zero. If the relationship is confirmed, the data will be split by sex to explore potential differences

between boys and girls in the strength of the correlations (RQ3), and Pearson correlation coefficients of the two groups will be compared. Furthermore, the correlation coefficients will be compared statistically using the single-sided test (Lenhard & Lenhard, 2014). While a significant negative correlation in both genders is expected, a significantly stronger correlation in males is hypothesised (H3).

Finally, to explore the research question regarding the potential difference in the predictive power of self-control on cybercrime compared to traditional delinquency among adolescents (RQ4) results from two logistic regression models will be compared. However, first, we need to analyse each of the models separately to establish whether there is a significant relationship between both self-control and traditional delinquency as well as between self-control and cybercrime when looked at independently. It is hypothesised, that self-control will be a significant predictor in both of the models (H4A and H4B). Null hypotheses will be rejected if significant beta coefficients are found. Furthermore, sex and school type will be included in the analyses to determine if these additional predictors can significantly enhance the model's explanatory power. Lastly, to seek an answer to the research question of whether the predictive power of self-control differs between the two models, the results will be compared and discussed in the discussion section, as there is no suitable statistical analysis to compare two non-nested logistic regression models.

All the analyses are conducted with the use of the IBM SPSS Statistics programme, version 29.0.1.0 from 2023.

4.5 Research ethics

The data collection for the ISRD-4 research followed the standardized research protocol (ISRD-4 Study Protocol) created by the project's international steering committee composed of leading criminologists. The research protocol detailed every phase of the project, including adherence to all ethical aspects of social science research. The participation of the Department of Sociology, Faculty of Arts, Charles University in the ISRD-4 project is formalized by signing the Agreement on participation in ISRD-4.

After being contacted by the research team, the principal gave consent for the participation of the selected class (or classes). Participation of students was entirely voluntary, and they could withdraw from the study at any time. The examiner communicated these facts before starting the survey, and they were also part of the questionnaire's introduction, where respondents

indicated their consent to participate in the research (see the beginning of the questionnaire in Appendix B). If consent was not granted, the child did not continue with the survey. A written informed consent was not required and no identifying data from the participants was requested.

However, parents of primary school students (8th and 9th grades) and equivalent grades in multi-year grammar schools were pre-informed about the research and were given the option to refuse their child's participation, i.e., an opt-out parental consent (see Appendix E). Parents received the information at least a week prior to the data collection from a contact person at school (usually the class teacher or principal) through a standard school communication system, for example a widely used information system "Bakaláři". This person was also responsible for recording any refusals of participation from the parents and for communicating them to the examiner before the start of data collection so that these children could be excluded from the study prior to the start. For high school students, parental consent for participation was not required (in accordance with SIMAR standards).

During the time of data collection, a trained examiner was present on site to ensure the anonymity of the responses was not compromised and to be available to assist the students if necessary.

Data collection for the entire ISRD4 project was conducted through LimeSurvey, operated by the University of Tartu. After data collection was completed, the dataset for all countries was made available to all ISRD-4 researchers (without any means to identify schools or classes). As an international study aimed at gathering data for comparative analyses, data sharing with other researchers is fundamental to the ISRD-4 project.

Data from the Czech Republic will be integrated into the international dataset by the ISRD-4 international steering committee and, after a certain period of time (approximately 2-3 years), will become available to the professional community through a data archive. This public dataset will also not contain any identifying information related to individuals, or the participating schools and classes.

5. Results

In the following chapter, the research results will be presented. Firstly, prior to conducting any analyses, the *recoding and transformation* of variables is detailed. Secondly, to gain a brief initial overview of the investigated variables, *descriptive statistics* are explored. Thirdly, results from a *reliability analysis* of the self-control scale are reported. Finally, all of the posed research questions are addressed.

5.1 Recoding and transformation

In the process of cleaning data, we found a subset of responses containing unrealistic values in the incidence of committed delinquent acts. These responses included for instance negative values below zero or in contrast, delinquency counts over 1000 acts. Given the context and the realistic scope of the measured behaviours, responses exceeding these limits were determined as invalid data entries and hence recoded as missing data. This recoding maintains the integrity and validity of the dataset by ensuring that the analyses are not skewed by anomalous data.

As mentioned already in the methods section, traditional delinquency, i.e., in-person offences, was assessed based on the occurrence of two or more instances of property, violent, or other type of crime (any kind of delinquency included in the study except for cybercrime offences), in the past year. Therefore, a sum variable of all offline delinquent acts was created. Consequently, a binary variable was computed with code 1 indicating participants who have committed two or more delinquent acts (regardless of the type, excluding cybercrime) in the past twelve months and code 0 for those who have reported either one instance of delinquent behaviour or any. This variable was then used for further analyses as an indicator of traditional delinquency. Cybercrime indicator was computed respectively, including cybercrime offences only and resulting in a binary variable coded in the same way.

The threshold of two delinquent acts was set in order to distinguish between one-time misconduct and repeated delinquent behaviour. Engagement in at least two offences in the past year is more indicative of youth at higher risk of continued criminal behaviour, and hence better representing the targeted group of juvenile delinquents. This approach aligns with the agreed-upon strategy of the research team, previously utilized in earlier waves of the ISRD. The goal is to exclude the influence of isolated incidents, ensuring that the data focuses on continuous delinquent patterns, which are critical for accurately assessing and addressing juvenile delinquency.

In order to compute the self-control variable, scores had to be properly coded to make sure that the higher the score, the higher the level of self-control implied. The self-control scale included six items, none of which had to be reversed. After confirming the appropriate coding of the item scores, a composite mean score was calculated to create the self-control scale index.

5.2 Descriptive statistics

To gain a brief initial overview of the investigated variables, descriptive statistics were explored. Table 2 shows effective sample sizes as well as missing values, means, standard deviations, and minimum and maximum values for each of the variables used in this thesis.

The mean self-control score among respondents was 2.99 ($SD = .78$) on a 5-point Likert scale, indicating rather higher levels of self-control among respondents. There were 26 missing values in the self-control data, which will be excluded listwise from the analysis. Traditional delinquency had a mean of 18.12 acts ($SD = 73.06$), which is almost six times higher than the mean amount of cybercrime acts of 3.52 ($SD = 33.85$). Despite the exclusion of the extreme unrealistic values from the dataset, the standard deviations remain to be high as the amount of committed delinquent acts varied substantially among respondents. For a visual representation of the distribution of each variable, please see the histograms provided in Appendix A – Figures A1, A2, and A3.

Table 2

Descriptive statistics of the variables

	N		Mean	Std. Deviation	Minimum	Maximum
	Valid	Missing				
Self-Control	2089	26	2.99	.78	1	5
Traditional Delinquency	2109	6	18.12	73.06	0	900
Cybercrime	2113	2	3.52	33.85	0	999
All Delinquent Acts	2105	10	20.38	77.77	0	730

Table 3 provides an overview of the descriptive statistics for males and females separately. There is almost no difference in the means of reported levels of self-control between the two sexes. In contrast, the mean of cybercrime involvement instances was found to be 7.08 ($SD = 48.94$) in boys, whereas only .36 ($SD = 3.77$) in girls.

On top of that, boys reported on average more instances of traditional delinquency than girls. The potential significance of the differences between the two sexes as well as the relationships between the variables were further explored in the subsequent analyses.

Table 3*Descriptive statistics of the variables per sex*

Sex		N	Minimum	Maximum	Mean	Std. Deviation
Male	Self-Control	980	1	5	2.99	.78
	Traditional Delinquency	991	0	900	21.60	79.90
	Cybercrime	995	0	999	7.08	48.94
	All Delinquent Acts	987	0	730	26.02	88.40
	Valid N (listwise)	970				
Female	Self-Control	1109	1	5	2.98	.78
	Traditional Delinquency	1118	0	526	15.04	66.29
	Cybercrime	1118	0	105	.36	3.77
	All Delinquent Acts	1118	0	526	15.40	66.64
	Valid N (listwise)	1109				

Furthermore, Table 4 presents the prevalence of traditional delinquency and cybercrime, operationalised as engagement in two or more instances of delinquent behaviour, across both sexes and in total. Again, an obvious gender disparity in cybercrime involvement is evident, with 14% of boys and only 4% of girls. Similarly, differences between boys and girls in traditional delinquency engagement are observed (28% of boys and 10% of girls).

Table 4*Traditional delinquency and cybercrime incidence by sex*

		Males		Females		Total	
		N	%	N	%	N	%
Traditional Delinquency Indicator	1	280	28%	226	20%	189	24%
	0	717	72%	892	80%	1926	76%
Cybercrime Indicator	1	139	14%	50	4%	506	9%
	0	858	86%	1068	96%	1609	91%

Note. Code 1 stands for two or more instances of corresponding forms of delinquent behaviour whereas code 0 represents one or zero instances.

5.3 Reliability analysis

Reliability analysis was conducted to examine the internal consistency of the modification of Grasmick and colleagues' (1993) self-control scale used in the ISRD-4 questionnaire. As mentioned in the methods section, the reduced scale consisted of two dimensions, impulsivity and risk-taking, each comprised of three items.

The analysis of the entire scale showed acceptable reliability ($\alpha = .745$). In order to further verify the reliability, each of the dimensions was analysed separately. This analysis revealed a

poor internal consistency of the impulsivity dimension ($\alpha = .543$). Nevertheless, it is important to note that the dimension consisted of three items only, which can cause Cronbach's alpha to be overly restrictive. Therefore, the average inter-item correlations of the impulsivity dimension were checked. The inter-item correlations were found to fall within the advisable range of .2 to .5, indicating a desirable internal consistency (see Table A2 in Appendix A). The reliability analysis of the risk-taking dimension demonstrated a good internal consistency ($\alpha = .808$).

These results indicate that while a refinement of the impulsivity dimension might be appropriate to enhance its reliability, the overall self-control scale demonstrates conventionally acceptable levels of internal consistency and hence can be used for further analysis. The results of the reliability analyses are summarized in Table 5.

Table 5

Reliability statistics of the self-control scale

Scale	N of items	Cronbach's Alpha
Overall Self-Control	6	.745
Impulsivity	3	.543
Risk-Taking	3	.808

5.4 The influence of gender and school type on the level of self-control in adolescents

To investigate the first research question (RQ1) a factorial ANOVA was conducted to test the main and interaction effects of sex and school type on self-control levels among adolescents. Prior to executing the analysis, appropriate assumptions (normality, homogeneity of variances and independence of errors) were checked. None of the assumptions were violated (see Appendix F).

The results of the analysis are detailed in Table 6. There was no significant effect of sex on the levels of self-control, $F(1, 2079) = .020, p = .887, \eta_p^2 = .000$. However, the effect of school type was found to be significant, $F(4, 2079) = 8.458, p < .001$ with $\eta_p^2 = .016$ indicating a large effect. The interaction effect between sex and school type was not significant, $F(4, 2079) = 1.568, p = .180, \eta_p^2 = .003$, and hence no follow-up analyses were performed.

Table 6*Factorial ANOVA, tests of between-subjects effects*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	23.454 ^a	9	2.606	4.345	<.001	.018
Intercept	12442.393	1	12442.393	20746.747	<.001	.909
sex	.012	1	.012	.020	.887	.000
School type	20.290	4	5.072	8.458	<.001	.016
Sex * School type	3.762	4	.941	1.568	.180	.003
Error	1246.833	2079	.600			
Total	19894.604	2089				
Corrected Total	1270.287	2088				

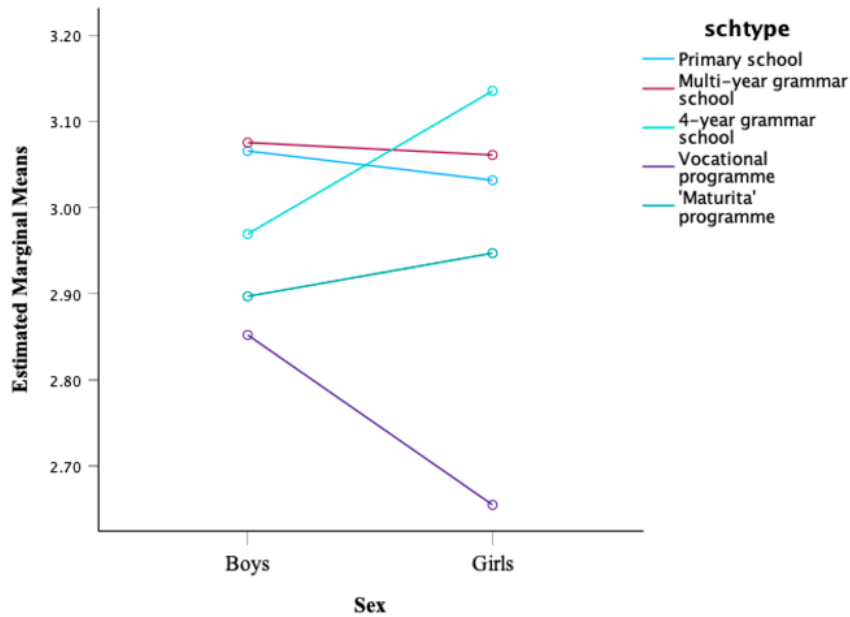
^a. R Squared = .018 (Adjusted R Squared = .014)

The interaction is illustrated in Figure 1. Although the effect was found to be nonsignificant, few interesting outcomes became apparent in the graph visualisation. Firstly, there is a contrast in the trend of self-control in girls attending 4-year grammar schools compared to girls following a vocational programme. Secondly, these two school types show the biggest differences between boys and girls – in vocational programmes, girls tend to have lower levels of self-control than boys and in 4-year grammar schools, girls show higher levels of self-control than boys. Finally, the lowest levels of self-control overall were measured in adolescents attending the vocational programme, followed by youth from “maturita” programmes. Students from multi-year grammar schools and primary schools, i.e., students from 8th and 9th grades, yielded very similar results between both boys and girls, both showing rather higher levels of self-control.

Furthermore, it is important to note that the school type, i.e., particular school years, also reflect the effect of participants’ age. Thus, this suggests that younger boys and girls (attending 8th and 9th grades) do not differentiate in self-control levels as much as the older adolescents in this study (attending the first two years of high school).

Figure 1

Estimated marginal means of self-control



5.5 Self-control and delinquency

A correlational analysis was conducted to test the hypothesis that there is a negative relationship between high levels of self-control and juvenile delinquency (H2). As demonstrated in Table 7, a significant negative Pearson correlation of small effect size was found, $r = -.136, p < .001$. As such, we can conclude there is a negative relationship between the two variables and hence reject the null hypothesis. Furthermore, this result allows for further regression analysis and comparison of traditional and cyber delinquency.

Table 7

Correlation between self-control and juvenile delinquency

		All Delinquent Acts	Self-Control
All Delinquent Acts	Pearson Correlation	1	-.136**
	Sig. (2-tailed)		<.001
	N	2105	2079
Self-Control	Pearson Correlation	-.136**	1
	Sig. (2-tailed)	<.001	
	N	2079	2089

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

Sex comparisons

To explore the potential differences between boys and girls in the relationship between self-control and juvenile delinquency (RQ3), the correlation coefficients were compared. The results shown in Table 8 reveal significant negative correlations in both boys and girls. A stronger correlation was found in boys ($r = -.191, p < .001$) compared to girls, where the correlation strength is particularly weak ($r = -.076, p = .011$). The correlation coefficients were compared statistically using the single-sided test (Lenhard & Lenhard, 2014). The difference between the sexes was found to be significant ($z = -2.663, p = .004$). This is in line with our expectation that the correlation will be stronger in boys compared to girls.

Table 8

Correlation between self-control and juvenile delinquency per sex

Sex		All delinquent acts		Self-control
Boys	All delinquent acts	Pearson Correlation	1	-.191**
		Sig. (2-tailed)		<.001
		N	987	970
	Self-Control	Pearson Correlation	-.191**	1
		Sig. (2-tailed)	<.001	
		N	970	980
Girls	All delinquent acts	Pearson Correlation	1	-.076*
		Sig. (2-tailed)		.011
		N	1118	1109
	Self-Control	Pearson Correlation	-.076*	1
		Sig. (2-tailed)	.011	
		N	1109	1109

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

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

5.6 Impact of self-control on cybercrime compared to traditional delinquency

In order to answer the research question regarding potential differences in the predictive power of self-control on cybercrime compared to traditional delinquency (RQ4), two separate logistic regression analyses were conducted and odds ratios were explored.

Prior to the analysis, all relevant assumptions were checked and none of them was violated (see Appendix G). Firstly, a logistic regression model with traditional delinquency as a dependent variable was fitted. Secondly, a logistic regression model with cybercrime as a dependent variable was explored. And finally, results of these two analyses are compared and discussed in the discussion section of this thesis.

5.6.1 The predictive value of self-control on traditional delinquency

To assess the effect of self-control on the likelihood of engaging in traditional delinquency (RQ4, Model 1) a logistic regression analysis was conducted and the odds ratios were checked.

Due to an imbalance in the dataset with fewer cases engaging in delinquency, the classification cut-off value was adjusted from the default .5 to .3 to improve the model's sensitivity in detecting the cases of engagement in delinquency. This adjustment resulted in a higher percentage of correctly classified engagement cases, increasing sensitivity from 4.2% to 41.2% while maintaining specificity of 82.3%, and an overall classification accuracy of 72.4% (see Table 9).

Table 9

Classification table^a

		Observed	Predicted		Percentage Correct
			Traditional Delinquency Indicator		
			No	Yes	
Step 1	Traditional Delinquency Indicator	No	1304	280	82.3
		Yes	297	208	41.2
Overall Percentage					72.4

^a The cut value is .300

The model was found to be statistically significant, -2 likelihood = 2174.178, $\chi^2(1) = 136.591$, $p < .001$. Based on the results in Table 10, self-control is a significant predictor of traditional delinquency, $B = -.804$, $W = 123.850$, $p < .001$. Furthermore, the odds ratio Exp(B) of .448 indicates that higher self-control is associated with decreased odds of traditional delinquency. In other words, for each unit increase in self-control, the odds of engaging in traditional delinquency decrease by 55.2%⁵.

Table 10

Logistic regression results for traditional delinquency and one predictor

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Self-Control	-.804	.072	123.850	1	<.001	.448	.389	.516
	Constant	1.161	.206	31.686	1	<.001	3.193		

^a Variable(s) entered on step 1: SelfControl_Mean.

⁵ The decrease in odds was calculated using the formula $(1 - \text{Exp}(B)) * 100$.

This model explained 9.5% of the variability in traditional delinquency (Nagelkerke $R^2 = .095$), see Table 11 for the model summary. These results suggest that self-control explains a small, yet significant part of the variance in traditional juvenile delinquency. The 95% confidence interval for the odds ratio is [.389; .516] and as it does not include 1, we can reject the null hypothesis.

Table 11

Summary of a simple model with one predictor (Model 1C)

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	2174.178 ^a	.063	.095

^a Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Extended models

To see whether we can improve the model, two more predictors were added in line with our previous analyses – sex and school type. According to the results outlined in Table 12, sex is a significant predictor of traditional delinquency, $B = -.494$, $W = 21.264$, $p < .001$. The log odds ($\text{Exp}(B) = .610$) indicate that girls are 39% less likely to engage in traditional delinquency than boys. On the other hand, the effect of school type was not found to be significant. The overall model explains 11.1% of the variability in traditional delinquency (Nagelkerke $R^2 = .111$) with a –2 Log likelihood of 2150.095 (see the model summary in Table 13).

Table 12

Logistic regression results for traditional delinquency and three predictors

Step 1 ^a		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
	Self-Control	-.810	.073	122.042	1	<.001	.445	.385	.513
	Schooltype			2.426	4	.658			
	(1)	-.214	.175	1.502	1	.220	.807	.573	1.137
	(2)	-.211	.226	.874	1	.350	.810	.520	1.260
	(3)	.025	.176	.020	1	.889	1.025	.726	1.447
	(4)	-.016	.129	.016	1	.899	.984	.763	1.268
	Sex (1)	-.494	.107	21.264	1	<.001	.610	.495	.753
	Constant	1.471	.232	40.069	1	<.001	4.354		

^a Variable(s) entered on step 1: Self-Control, Schooltype, Sex....

Table 13*Summary of the extended model (three predictors; Model 1A)*

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	2150.095 ^a	.074	.111

^a Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

As it was found that school type is not a significant predictor, a model where only self-control and sex are included was computed. This model resulted in the -2 Log likelihood of 2152.572 and 10.9% of explained variability (Nagelkerke $R^2 = .109$), see Table 14. The results of the analysis of this model are outlined in Table 15.

Table 14*Summary of the extended model (two predictors; Model 1B)*

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	2152.572 ^a	.073	.109

^a Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 15*Logistic regression results for traditional delinquency and two predictors*

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Step 1 ^a								
Self-Control	-.815	.073	125.419	1	<.001	.442	.384	.510
Sex (1)	-.494	.107	21.414	1	<.001	.610	.495	.752
Constant	1.441	.217	44.153	1	<.001	4.226		

^a Variable(s) entered on step 1: Self-Control, Sex

Likelihood Ratio Test

To find the most parsimonious model best fitting the data, a Likelihood Ratio Test (LRT) was performed. As SPSS does not offer this analysis, the test was computed manually by subtracting the -2 Log likelihood of a simpler model from a more complex model and comparing the resulting value with a relevant critical value in a χ^2 distribution table (retrieved from Statext.com). The degrees of freedom equalled the number of added or removed variables.

Firstly, the most complex model (Model 1A; predictors: self-control, sex, and school type) was compared to a less complex model (Model 1B; predictors: self-control and sex). The difference in -2 Log likelihoods was 2.477 (Df = 1) and the corresponding critical value from the χ^2 distribution table ($\alpha = .05$) was 3.841. In order for the LRT to be significant, the χ^2 value for our model would have to be larger than the critical value. Thus, the LRT was concluded not to be significant, meaning that the removal of the school-type predictor does not worsen the model and hence the simpler model is preferred.

Secondly, Model 1B was compared to the most simple model (Model 1C; predictor: self-control) in order to find the most optimized model. The difference between the two -2 Log likelihoods was 21.601 (Df = 1), which is larger than the established critical value of 3.841. Therefore, the LRT is significant and Model 1B, including both self-control and sex as predictors, is considered the most parsimonious model.

5.6.2 The predictive value of self-control on cybercrime

Another logistic regression model was fitted to assess the effect of self-control on the likelihood of cybercrime (RQ4, Model 2). Similarly, as with the previous model, the imbalance of data caused a very low sensitivity in detecting cases of engagement in cybercrime. Thus, the cut-off value was adjusted from .5 to .15 to improve the model's sensitivity. As a result, the sensitivity increased from 0 to 16% and the overall accuracy remained high, 85.4% (see Table 16).

Table 16

Classification table

		Predicted			Percentage Correct
		Cybercrime (2 or more)			
Observed		No	Yes		
Step 1	Cybercrime (2 or more)	No	1754	148	92.2
		Yes	157	30	16.0
Overall Percentage					85.4

Note. The cut-off value is .150

The model was found to be statistically significant, -2 likelihood = 1225.205, $\chi^2(1) = 34.119$, $p < .001$ and self-control was found to be a significant predictor of cybercrime, $B = -.582$, $W = 33.093$, $p < .001$ (see Table 17). The odds ratio of $\text{Exp}(B) = .559$ suggests that higher self-control is related to a lower probability of engaging in cybercrime. Specifically, for each unit

increase in self-control, the odds of engaging in cybercrime decrease by 44.1%. As the odds ratio 95% confidence interval does not include 1, we can reject the null hypothesis.

Table 17

Logistic regression results for cybercrime and one predictor

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Self-Control	-.582	.101	33.093	1	<.001	.559	.458	.681
	Constant	-.665	.284	5.471	1	.019	.514		

^a Variable(s) entered on step 1: SelfControl_Mean.

According to the Nagelkerke R^2 of .036, this model explained 3.6% of the variance in cybercrime (see the summary in Table 18). Although this simple model does not explain much of the variance in cybercrime, it can be concluded that self-control is indeed a significant predictor.

Table 18

Summary of a simple model with one predictor (Model 2C)

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1225.205 ^a	.016	.036

^a Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Extended models

Same as with traditional delinquency, to see whether we can improve the model with cybercrime as a dependent variable, sex and school type were added as additional predictors to the model. Results shown in Table 19 suggest that school type is not a significant predictor of cybercrime. In contrast, sex was found to be significant, $B = -1.295$, $W = 54.966$, $p < .001$. This indicates a robust difference in the likelihood of cybercrime instances between adolescent boys and girls, as being a female is associated with a decrease in the log odds of engaging in cybercrime compared to being a male. The odds ratio for sex was 0.274, suggesting that females are 72.6% less likely to engage in cybercrime compared to males (while holding other variables constant). According to the model summary (Table 20), 10.3% of the variability in cybercrime was explained (Nagelkerke $R^2 = .111$), with a -2 Log likelihood of 1159.958.

Table 19*Logistic regression results for cybercrime and three predictors*

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Self-Control	-.613	.105	33.999	1	<.001	.542	.441	.666
	Schooltype			2.070	4	.723			
	(1)	-.306	.262	1.359	1	.244	.737	.441	1.232
	(2)	-.354	.356	.987	1	.320	.702	.349	1.410
	(3)	-.053	.252	.045	1	.832	.948	.579	1.553
	(4)	-.106	.192	.305	1	.581	.899	.617	1.311
	Sex (1)	-1.295	.175	54.966	1	<.001	.274	.194	.386
	Constant	.042	.325	.017	1	.897	1.043		

^a Variable(s) entered on step 1: Self-Control, Schooltype, Sex

Table 20*Summary of the extended model (three predictors; Model 2A)*

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1159.958 ^a	.046	.103

^a Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

To optimize the model, school type was removed from the predictors resulting in a model with two predictors – self-control and sex. This model explained 10% of the variability in cybercrime (Nagelkerke $R^2 = .100$), with a -2 Log likelihood of 1162.104 (see Table 21). The logistic regression results are detailed in Table 22.

Table 21*Summary of the extended model (two predictors; Model 2B)*

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1162.104 ^a	.045	.100

^a Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

Table 22*Logistic regression results for cybercrime and two predictors*

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Self-Control	-.612	.104	34.599	1	<.001	.542	.442	.665
	Sex (1)	-1.297	.174	55.435	1	<.001	.273	.194	.385
	Constant	-.056	.300	.035	1	.851	.945		

^a Variable(s) entered on step 1: Self-Control, Sex***Likelihood Ratio Test***

In order to find the best fitting model, an LRT was computed between the following models: Model 2A (predictors: self-control, sex, and school type), Model 2B (predictors: self-control and sex), and Model 2C (predictor: self-control).

The difference between the -2 Log likelihoods of Model 2A and Model 2B was 2.146 (Df = 1), which is lower than the corresponding critical χ^2 value (3.841, $\alpha = .05$). Therefore, the LRT was not significant. In other words, the extended model does not fit the data significantly better than the reduced model, and hence the simpler model is preferred.

However, the difference in the -2 Log likelihoods of Model 2B and Model 2C was 63.101 (Df = 1), indicating that the addition of sex as a predictor significantly improves the model and hence the extended model is accepted.

6. Discussion

This thesis aimed to explore the relationship between self-control and juvenile delinquency within a Czech adolescent sample as a part of the ISR4 study. Our study included participants aged 12 to 21, while the target age range for the ISR4 is 13 to 17, focusing specifically on adolescents. This broader age range may raise questions about the inclusion of participants who are either too young or too old compared to the target group. Even though excluding these outliers might have aligned more closely with the ISR4's intended age range, we have decided to retain these participants because our sampling was representative of school years rather than of age. Thus, this approach maintains the representativeness of the sample in the context of the educational environment, one of the crucial aspects of our analyses. The research examined the influences of sex and school type on self-control levels and investigated the relationship between self-control and delinquency including potential sex differences. Additionally, logistic regression models were fitted separately to traditional delinquency and cybercrime to assess whether self-control's predictive value varies between offline and online offences.

The analyses revealed several key findings. Firstly, results indicated that school type significantly affects self-control, while in contrast, sex did not show any significance. Secondly, the correlational analysis confirmed a relationship between self-control and delinquency in the Czech adolescent sample, with a notable difference between boys and girls. Finally, logistic regression further revealed that self-control and sex are significant predictors of both traditional and cyber delinquency. These findings are further discussed in detail below together with corresponding limitations and future research implications, following the order of the results section and including a comparison of the two logistic regression models.

6.1 The influence of gender and school type on the levels of self-control in adolescents

In line with our expectations, a significant effect of school type on self-control levels was found in our sample. This aligns with previous studies suggesting that specific school characteristics, such as school discipline or location (Beaver et al., 2008; Li et al., 2020; Turner et al., 2005) can play a pivotal role in shaping students' self-control. Our analysis revealed a large effect size, suggesting that different educational tracks provide varying environments that can either foster or hinder the development of self-control among youngsters. For instance, grammar schools, often characterized by a highly demanding academic environment that requires a

certain amount of self-discipline among its students, may foster the development of self-control. In contrast, vocational tracks, which usually focus more on immediate skill acquisition and have generally lower demands, can subsequently increase the tendency toward risky behaviour by potentially providing students with more free time and opportunities to engage with delinquent peers and illegal activities. This principle was proposed already by Hirschi in the context of Social Control Theory (1969) and supported by Cohen and Felson's Routine Activity Theory (1979), highlighting the link between increased unsupervised time and higher delinquency risk.

However, it is important to consider that the relationship between school type and self-control can be bidirectional. This means that individuals with lower levels of self-control may be more inclined to choose less demanding academic environments, while in turn, these settings may also hinder the development of self-control. This ambiguity suggests that it is challenging to determine whether certain school types contribute to lower self-control levels or whether students with lower self-control are more likely to choose to attend these types of schools. This could be addressed in future research by tracking students longitudinally to determine whether their self-control levels change significantly based on their choice of school. Despite this ambivalence, this is an important finding that offers valuable insight into the current educational landscape in the Czech Republic in terms of self-control among students. Furthermore, it allows for the development of tailored interventions for the identified at-risk school types.

In contrast to the General Theory of Crime by Gottfredson and Hirschi (1990), which posits that there is a notable gender gap in self-control among adolescents, our results revealed no significant effect of sex on self-control levels. This finding is also contrary to earlier studies supporting Gottfredson and Hirschi's hypothesis, such as Turner and Piquero (2002), and the findings of Hayslett-McCall and Bernard (2002) and Svensson (2003), that pointed out that boys typically develop lower self-control levels due to a less strict parental supervision and weaker emotional bonds. On the other hand, our results align with some of the more recent studies, for example with research by Jo and Armstrong (2016) or Thijs and colleagues (2015), who found no significant differences in self-control development between boys and girls. This recent research trend challenges traditional gender stereotypes and perspectives on sex differences, suggesting that these differences are becoming less pronounced over time.

Even though the main effect of sex as well as the interaction effect was found to be nonsignificant, the graph illustrating the interaction revealed some noteworthy trends offering insights into how different educational environments may potentially relate to self-control

levels among boys and girls (refer to Figure 1 in the Results section). Based on this graph, self-control appears to be affected differently between boys and girls among some of the school types. For instance, girls in 4-year grammar schools exhibited higher self-control compared to boys, while girls in vocational programmes showed lower self-control than their male peers. This indicates that the structure and demands of different school types might contribute to shaping self-control in nuanced ways for each of the two genders. Especially since the levels of self-control were found to be almost equal in students attending the last two years of primary school, or a corresponding level at a multi-year grammar school. This suggests that differences between boys and girls are more pronounced during high school years, i.e., in older children, which supports multiple recent studies highlighting the malleability of self-control during adolescence (e.g., Burt et al., 2014; Forrest et al., 2019; Jo & Armstrong, 2018; Zondervan-Zwijenburg et al., 2020).

However, while these findings are important to take into account, they have not been found to be significant and hence this interpretation is only speculative. It is important to note that the proportion of boys and girls was not equal across all school types in our sample. This imbalance could potentially bias the results, making it harder to draw definitive conclusions about the interaction between school type and gender. Future research should aim to examine these dynamics with more balanced sex distributions across school types to ensure generalizable findings. Additionally, longitudinal studies could provide deeper insights into how these educational contexts influence self-control development in boys and girls over time.

6.2 Self-control and delinquency

In line with the robust theoretical background, we have found a significant correlation between self-control and juvenile delinquency. However, our results yielded only a small effect size, which could be attributed to several explanations. Firstly, differences in how self-control and delinquency are measured can affect the correlation strength. Secondly, the specific characteristics of our sample may play a role. Lastly, delinquency is influenced by a complex interplay of factors beyond self-control, such as peer influence, family dynamics, and socioeconomic conditions, which can dilute the direct impact of self-control. This has been supported by the data from ISRD-3, suggesting that besides self-control, the strongest predictors of delinquency include the number of delinquent friends, risky forms of free time activities, and disrupted moral judgements (Moravcová et al., 2015). However, it is important to note that the

effect of self-control remained significant even after accounting for these additional factors in the model.

The exploration of potential sex differences in the correlation strength revealed that boys demonstrated a stronger correlation between self-control and delinquency when compared to girls. This finding suggests that even though self-control does not significantly differ across the two genders, its impact on the tendency to engage in delinquent behaviours might be more pronounced in boys. This aligns with previous research indicating that boys are more likely to engage in risk-taking behaviours and are more influenced by their peers when self-control is low (Wong et al., 2010; Stults et al., 2021). However, this contrasts with the studies by Baek et al. (2018) and Blackwell and Piquero (2005) that concluded that self-control explains crime behaviour in both sexes equally. Due to some of the mentioned limitations to this analysis and as the primary focus of this thesis was elsewhere, the discussion regarding potential sex differences in the influence of self-control on juvenile delinquency remains open. A meta-analysis investigating this topic would allow for a more definitive conclusion.

Nevertheless, despite the overall weak correlation, the significant result suggests that self-control is indeed a meaningful factor in predicting delinquent behaviour. In the study at hand, the correlational analysis provided an initial exploration of the data that confirmed the existence of this relationship, serving as a foundation for more in-depth analyses that followed.

6.3 Logistic regression models

One of the challenges encountered during the logistic regression analyses was the imbalanced distribution of the dependent variables – both traditional delinquency as well as cybercrime. The majority of participants have either not engaged in any delinquent behaviour or have only done so once in the past year (coded as 0) and only a smaller proportion engaged in two or more instances of delinquency (coded as 1). This issue was especially pronounced in terms of cybercrime, where the initial regression model which used the default cut-off value of 0.5 failed to correctly classify any cases of cybercrime engagement. Therefore, the classification cut-off value was adjusted to find an optimal balance between sensitivity and specificity. After comparing several values, a cut-off value of 0.15 was selected. This provided a moderate sensitivity of 16% and a high specificity of 92.2%, resulting in an overall classification accuracy of 85.4%. As a result, the model effectively identified a reasonable number of engagement cases while maintaining a high rate of correctly identified non-engagement cases. This adjustment

was crucial for achieving a meaningful and practical model performance in the context of predicting engagement in cybercrime. The trade-off with specificity and overall accuracy favoured the 0.15 cut-off value as the most balanced and reliable choice for this analysis.

Similarly, the cut-off value in the logistic model with traditional delinquency as a dependent variable had to be adjusted. The default value of 0.5 was adjusted to 0.3, which increased the sensitivity in detecting engagement cases from 4.2% to 41.2% while maintaining an overall accuracy of 72.4%. These adjustments are particularly important when dealing with imbalanced datasets like ours. Lowering the cut-off value enabled the model to become more effective in detecting true positive cases of engagement in crime, which is crucial for our analysis. However, these adjustments also led to a slight decrease in specificity, i.e., an increase in false positive cases. Therefore, the adjustments were tailored to maintain acceptable levels of both sensitivity and specificity, while also increasing the overall classification accuracy. Future research should consider employing additional strategies, such as oversampling, to enhance the model's performance.

6.3.1 The predictive value of self-control on traditional delinquency

In line with the theoretical framework, including classical theories as well as recent research, the logistic regression analysis confirmed that self-control is a significant predictor of traditional delinquency in our sample. However, the initial model explained only 9.5% of the variability in traditional delinquency, indicating that while self-control is indeed one of the key factors (as also indicated by the Wald statistic), there are other pivotal influences that should be taken into account.

Consequently, two more predictors were added to the model – sex and school type. Sex emerged as a significant predictor with girls being 39% less likely to engage in traditional delinquency than boys. This finding is aligned with the theoretical background suggesting there are certain differences in socialization processes, making girls less influenced by low self-control and delinquent peers and hence also less prone to engage in risky and delinquent behaviours (Maers et al., 1998; Stults et al., 2021). On the contrary, school type was not found to have a significant influence, suggesting that the type of educational environment might not directly affect traditional delinquent behaviour or that its effect is mediated by other factors. Based on LRT, the model best fitting our data included two predictors – sex and self-control.

Nevertheless, this model explained 10.9% variability, indicating that juvenile delinquency is a complex phenomenon influenced by a wide range of different factors. Therefore, future research should explore the complexity and focus on including other potential predictors, such as family dynamics, socioeconomic status, psychological disorders, or peer influence – for example using multiple logistic regression.

6.3.2 The predictive value of self-control on cybercrime

The logistic regression model including cybercrime as a dependent variable revealed that self-control does significantly predict cybercriminality, which is in line with prior foreign research (Holt et al., 2020; Maimon & Louderback, 2019). However, similarly to traditional delinquency, despite the strong significance indicated by the Wald statistic, the single predictor only explained 3.6% of the variability in cybercrime. These results suggest that while self-control is an important factor in predicting cybercrime, it is again just one of many.

Adding the sex variable to the model revealed a significant gender difference in cybercrime engagement likelihood, with girls being 72.6% less likely to engage in cybercrime compared to boys. This finding is in contrast with a study by Macrum and colleagues (2014), who suggested that both sexes are equally likely to engage in cyberbullying. However, our study encompassed a broader range of cybercrimes beyond cyberbullying. Thus, this broader scope may explain the observed gender disparity, as other previous research indicates that boys are generally more involved in certain online offences, such as hacking (Hutchings & Chua, 2016). These findings highlight the potential for substantial gender differences across various types of cybercriminal behaviour. Future research should focus on exploring these differences in more detail by comparing various types of cybercrime to better understand the underlying gender dynamics.

School type was not found to be a significant predictor of cybercrime, and hence a model including sex and self-control as predictors was accepted. This optimized model explained 10% of cybercrime variability. Thus, while both self-control and sex are pivotal in understanding cybercrime, addressing the complex interplay of other influences in future research is crucial for developing effective prevention and intervention strategies tailored to different demographic groups.

6.3.3 Comparison of the two logistic regression models

To address the research question regarding potential differences in the predictive power of self-control on cybercrime compared to traditional, offline, delinquency, the results of the two analyses are compared. Results indicated that self-control serves as a predictor for both offline and online offences. Furthermore, school type was not found significant in influencing the likelihood of any of the crime engagement, as opposed to sex, which significantly predicts both traditional as well as cyber delinquency. However, some notable differences were observed and will be discussed below.

Firstly, self-control exhibited a stronger predictive power in terms of traditional delinquency, indicating a 55.2% decrease in the odds of engaging in traditional delinquency for each unit increase in self-control, compared to cybercrime, where the odds ratio indicated a 44.1% decrease in the odds of engaging in cybercrime for each unit increase in self-control.

Secondly, the simple model including self-control as a predictor explained 9.5% of the variability in traditional delinquency. In contrast, the same simple model managed to explain only 3.6% of the variability in cybercrime.

Lastly, a noteworthy difference in the effect of sex was found. In terms of traditional delinquency, the analysis revealed that girls are 39% less likely to engage in traditional delinquency than boys. The amount of explained variability changed only slightly by extending the model with sex. On the other hand, the results of the extended cybercrime model indicated a robust difference between boys and girls in cybercrime engagement, with girls being 72.6% less likely to engage in online offences than boys. Furthermore, the explained variability increased from 3.6% to 10.9%, further supporting the fact that sex plays a significant role in predicting cybercrime.

Based on these findings, we can conclude that the predictive power of self-control is stronger in the context of traditional delinquency than in cybercrime, while on the contrary, sex differences play a more pivotal role in cybercrime prediction. This suggests that while self-control is a significant predictor, there might be more influential factors, especially in predicting cybercriminality among adolescents. Future research should hence focus on investigating the potential predicting factors, that might differ from those we already know in the context of traditional delinquency. There is no existing literature yet that would explore these differences, even though understanding the distinct predictors of traditional delinquency and cybercrime

can contribute to more targeted interventions to reduce juvenile delinquency in its various forms – namely cybercrime, currently one of the top globally rising risks (WEF, 2023)

6.4 Other limitations and implications for future research

There are few more limitations to the study at hand that are worth addressing, which are mostly caused by the research design, the robustness, and the international nature of the study.

Firstly, the ISRD-4 is solely based on self-report data, which can be seen as its major limitation as it inherently increases the risk of biases that might lead to a decrease in the validity of the results. On the other hand, the main focus of this study is on self-control, which is a reflective construct, and on personal experiences with delinquency. This type of information can only be obtained from the perpetrators themselves as not all of the instances are reported to the security services. Thus, self-report is currently the best tool possible to collect this type of data. However, given that the data collection was done in the school environment and on school computers, it might have imposed some reluctance on the students to confess to delinquent behaviours due to fear of being exposed and subjected to certain repercussions. Moreover, despite monitoring the procedure of data collection, it is possible that some of the students engaged in discussions or looked at each other's computer screens. This may have also impacted their attitude towards the entire study by lowering the seriousness and hence result in hindering the reliability of the participants' answers. The disruption of privacy was eliminated by the presence of a trained examiner who supervised the data collection. Future studies might consider a more neutral environment that would provide a better sense of anonymity as well as privacy to ensure higher genuineness of the young participants.

Secondly, as all the students had to be informed about the study in advance, it is assumed that some of them might have intentionally avoided the data collection. Truancy is classified as a status offending behaviour that can partially predict delinquency (Shoemaker, 2017), and hence it is expected that at least some of these students might have engaged in some type of delinquent behaviour. This issue was partially addressed by obtaining data about missing students from the class teachers, including their assumed reasoning for their absence. Further research might consider several visits to the school to increase the probability of reaching these students.

Thirdly, research has shown that there is only a fine line between a seemingly harmless prank online and cybercriminal behaviour. This leads to young people often not realising they are engaging in cybercrime (Goldsmith & Brewer, 2015; Vaidhyathan, 2011). Thus, participants

of this study might have not considered some of their actions, like hateful messages for example, as serious or worth reporting, and hence the prevalence of cybercrime may be underestimated in our data. The reliability of cybercrime detection can be further enhanced by adding more control questions as well as detailed descriptions regarding online behaviour.

Fourthly, the impulsivity dimension of the self-control scale yielded questionable reliability. This issue was already encountered in the previous wave, the ISRD-3, which included three dimensions of Grasmick's self-control scale (Buriánek & Podaná, 2008). Thus, further refinement and potential retranslation of the questionnaire might be needed within the Czech context, as the impulsivity scale repeatedly shows low internal consistency. Additionally, an exploration of potential cultural adaptations could help to enhance the scale's reliability. Refinement of the impulsivity scale could consequently improve the overall effectiveness in measuring self-control among Czech adolescents.

Finally, the study was mostly limited to common educational institutions and only included a few special needs schools. Nevertheless, as we know from the literature, mental disorders are one of the prominent predictors of criminal behaviour (Whiting et al., 2020). Thus, it has to be noted that the results of our study cannot be generalized among all adolescents in the Czech Republic as we do not have data from this specific and significant segment of the young population that could have had a major impact on the study results. On one hand, this can be perceived as a limitation as it hinders the generalizability of the findings. On the other hand, the inclusion of special needs schools would come with several hurdles. Data collection in this school environment is often challenging and can place additional burdens on the children involved. Furthermore, some children, particularly those with intellectual disabilities, may struggle to understand and complete the questionnaire and hence require additional assistance. Moreover, these schools may not have the capacity to accommodate such studies due to high workload. Finally, adapting and standardizing the research methodology to ensure consistency across the participating countries would be an essential and tricky part of the process. To address this issue, it would be necessary to design a more flexible and accessible data collection approach that would minimize the disruption and provide tailored support for the students to complete the questionnaire, all while ensuring that the methodology is standardized across the participating countries.

Nonetheless, this study has some notable strengths that enhance its credibility and valuable contribution to the field of psychology and criminology. Firstly, with over 2000 participants, it

is the largest self-report delinquency study in the Czech Republic. This robust dataset collected in two big cities significantly increases the statistical power as well as the generalizability of the findings. Secondly, ISRD-4 is a standardized international study providing data from more than 50 countries around the world. This allows for cross-cultural comparisons and hence broadens the applicability of the results. Lastly, the use of self-reported data, despite its limitations mentioned earlier in this chapter, provides unique insights into the behaviours and experiences of young students that might not have been accessible through other methods, especially given the need for standardized procedures to ensure the comparability of the data.

Conclusion

The overarching goal of this thesis was to explore the relationship between self-control and juvenile delinquency among Czech adolescents, using data from the ISRD-4. Our findings highlight the critical role of self-control in predicting juvenile delinquency, with a more pronounced effect on traditional crimes compared to cybercrime. In addition, we found significant differences between boys and girls, suggesting that boys are more likely to engage in delinquency than girls. The disparity was especially pronounced in terms of cybercrime. Furthermore, our results revealed significant differences in self-control levels across various types of Czech educational institutions.

These findings have several implications for future research as well as practical interventions. Interventions tailored to the specific dynamics of traditional and cyber delinquency would be pivotal in their effective reduction. Furthermore, by identifying the most at-risk populations we are able to adjust the intervention programmes to these specific target groups and further enhance their effectiveness. Our findings suggest that future research should explore additional current predictors of delinquency, beyond self-control and gender, for both offline and online offences separately to address the specifics of various types of delinquency.

Moreover, the cross-country comparability of the data presents a unique opportunity to investigate how cultural and policy contexts can shape the dynamics between self-control and delinquency. For instance, similar research has been done by Podaná and Buriánek (2013), who used the data from ISRD-3 to investigate differences in the association between self-control and problematic drinking across 25 countries. Future research should utilize the current data from ISRD-4 to explore the differences between cybercrime and traditional delinquency predictors. This can contribute to the development of more effective, culturally sensitive interventions aimed at reducing juvenile delinquency.

In summary, this research enriches our understanding of how self-control affects juvenile delinquency, providing a solid foundation for further investigations into the factors driving traditional and cyber delinquency. Future studies can build upon these findings and delve deeper into these dynamics to further investigate the complexity of these relationships and hence to enhance the existing predictive models and intervention strategies.

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Appendix A: Additional Tables and Figures

Table A1

Overview of the sample characteristics

		N	%
Sex	Male	997	47.1%
	Female	1118	52.9%
	Total	2115	100%
Age	12 years old	1	0.0%
	13 years old	110	5.2%
	14 years old	476	22.5%
	15 years old	523	24.7%
	16 years old	530	25.1%
	17 years old	389	18.4%
	18 years old	61	2.9%
	19 years old	13	0.6%
	20 years old	5	0.2%
	21 years old	5	0.2%
	Missing	2	0.1%
	Total	2115	100%
City	Prague	985	46.6%
	Pilsen	1130	53.4%
	Total	2115	100%
School type	Primary school	824	39%
	Multi-year grammar school	283	13.4%
	Four-year grammar school	154	7.3%
	Vocational program	234	11.1%
	“Maturita” program	620	29.3%
	Total	2115	100%
Grade	8th grade	515	24.3%
	9th grade	508	24.0%
	1st year	563	26.6%
	2nd year	529	25.0%
	Total	2115	100%

Note. 1st and 2nd year refer to the first two years of high school.

Table A2

Inter-Item Correlations of the Impulsivity dimension of the Self-Control Scale

	Item 1	Item 2	Item 3
Item 1	1.00	.36	.19
Item 2	.36	1.00	.30
Item 3	.19	.30	1.00

Figure A1

Histogram of Self-control Scores

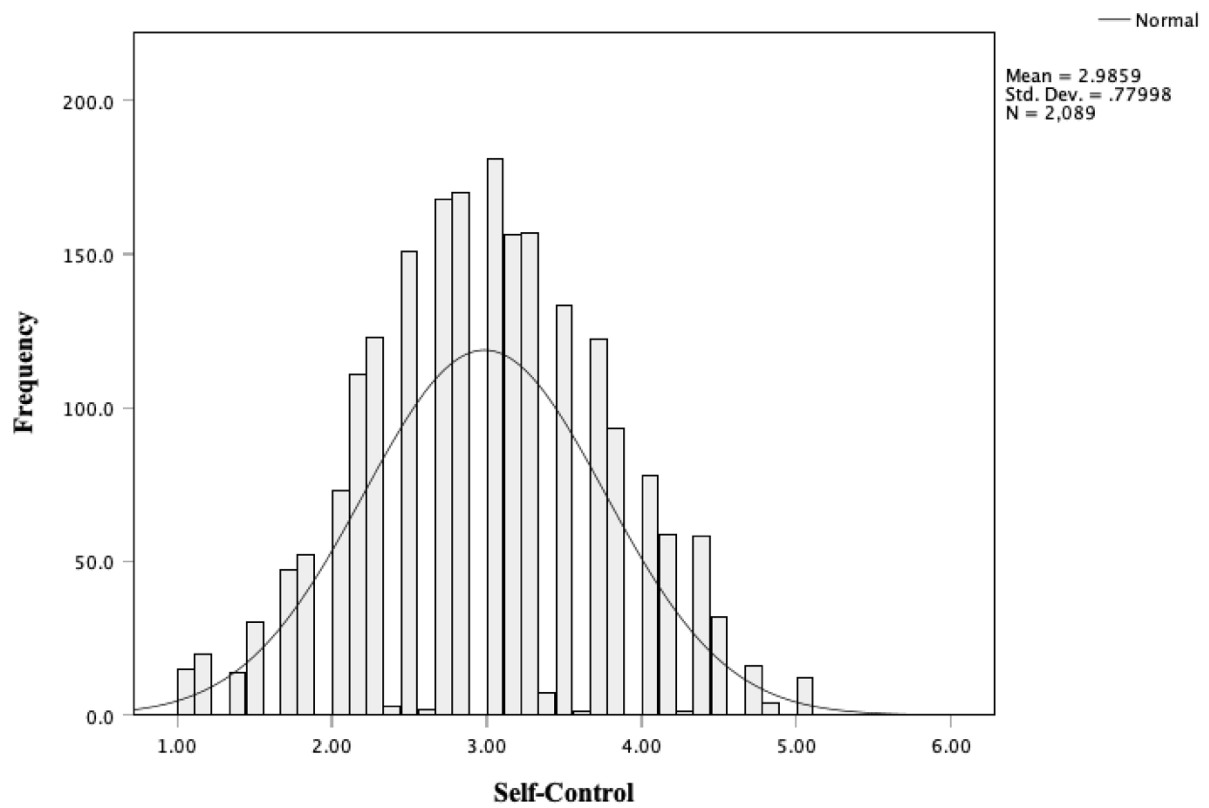
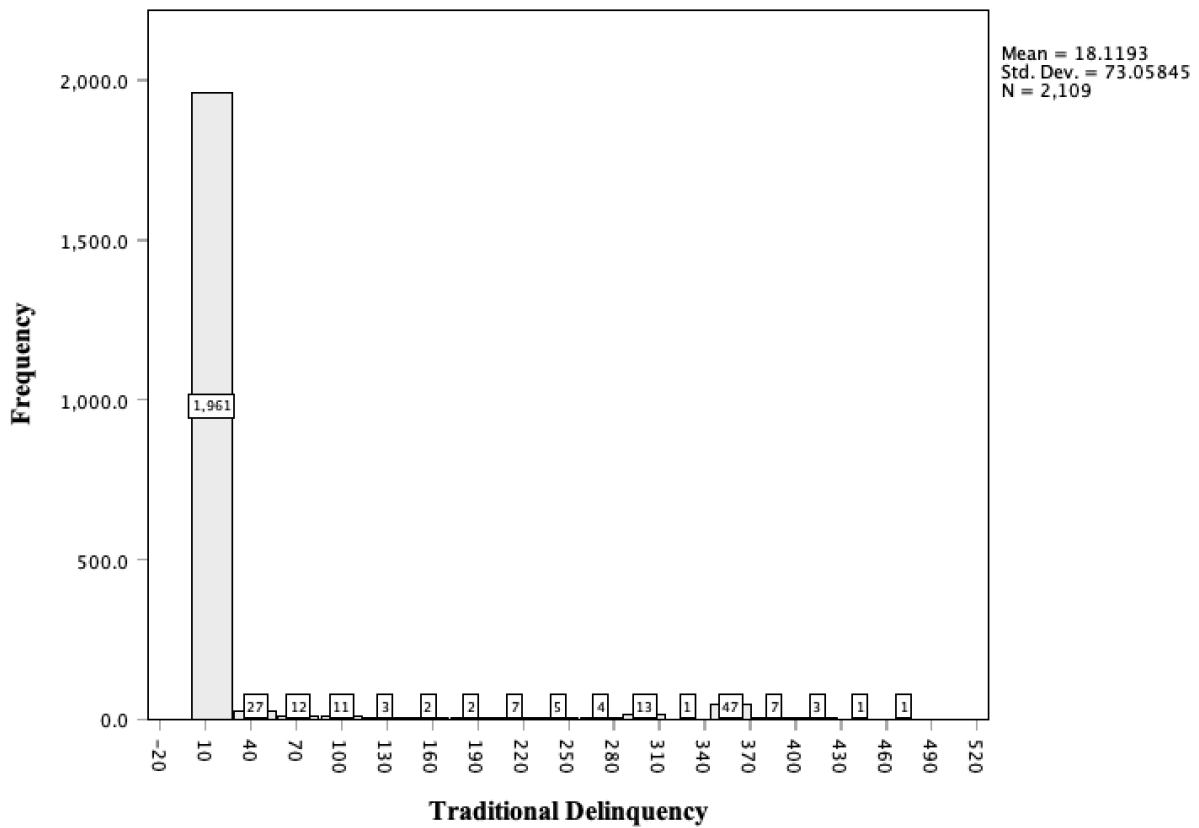


Figure A2

Histogram of Traditional Delinquent Acts

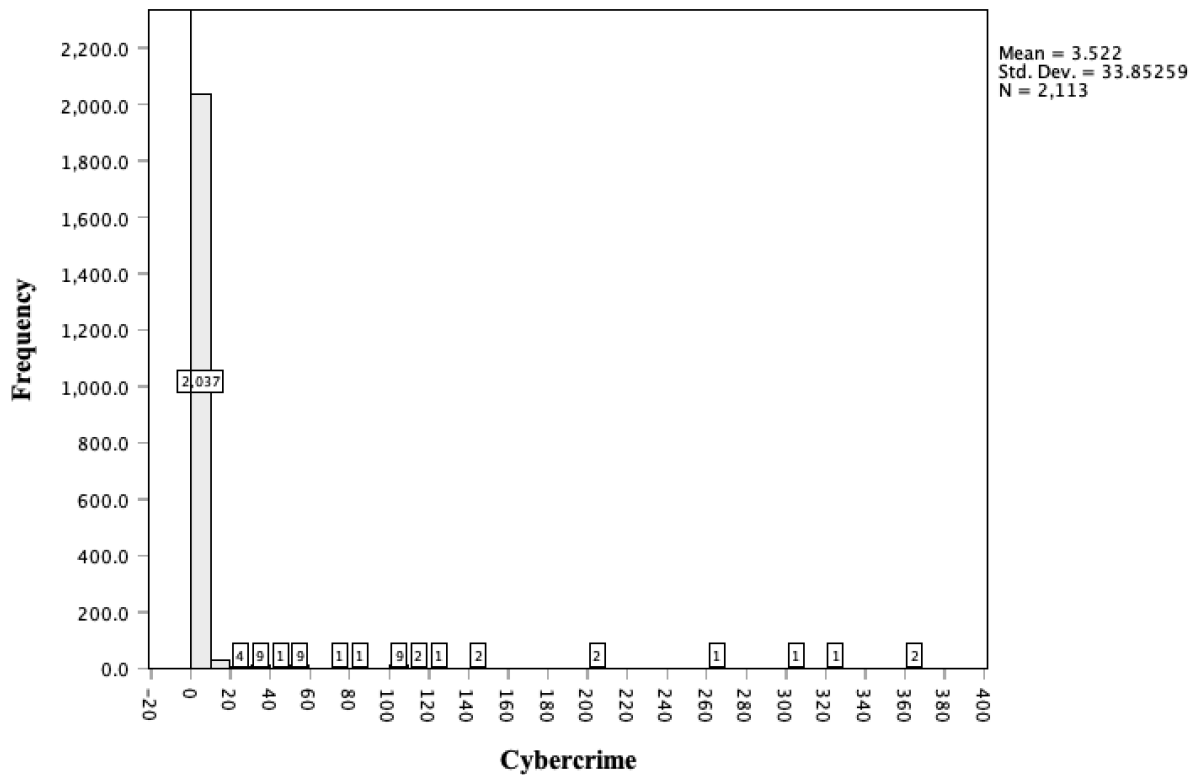


Note. There were only two cases above 500, thus the scale was adjusted to enhance readability.

According to the histogram in Figure A2, most respondents reported engaging in between 0 to 10 traditional delinquent acts over the past year. Additionally, there is a notable peak at 365 acts, indicating one delinquent act per day.

Figure A3

Histogram of Cybercrime Acts



Note. There were only three cases above 400, thus the scale was adjusted to enhance readability.

As we can see in Figure A3, the vast majority of respondents reported engaging in 0 to 10 cybercrime acts in the past year.

Appendix B: Relevant Items from the ISRD-4 Questionnaire⁶

Vítáme tě v mezinárodním výzkumu organizovaném katedrou sociologie Filozofické fakulty Univerzity Karlovy!

Spolu se stovkami dalších mladých lidí v České republice a po celém světě tě zveme, abys nám pověděl/a o svém životě, o svých každodenních aktivitách, vztazích s ostatními a o problémech, se kterými se můžeš potýkat.

Jedním z nejlepších způsobů, jak lidem porozumět, je naslouchat jim. V následujících částech dotazníku nám můžeš povědět o svých vlastních zkušenostech a podělit se o své názory. Nad otázkami příliš nepřemýšlej, odpovídej na ně spontánně.

Některé otázky se budou týkat i tvé zkušenosti s delikventním jednáním. Pokud se budeš cítit nepříjemně kvůli něčemu, co jsi zažil/a, nebo kvůli nějakému tématu, které tato studie nadnáší, je dobré si o tom popovídat s dospělým, kterému můžeš věřit. Existují také podpůrné služby, jako je třeba bezplatná Linka bezpečí (telefon: 116 111).

Průzkum obsahuje 161 otázek.

I Odpovědnost za výzkum bereme vážně

Nepotřebujeme od tebe žádné osobní identifikační údaje jako je tvé jméno, datum narození, adresa bydliště nebo tvá e-mailová adresa. Tvoji rodiče, učitelé ani přátelé tvé odpovědi nevidí. Ani náš výzkumný tým nebude vědět, kdo jak odpověděl. Výsledky průzkumu jsou uváděny pouze pro skupiny respondentů, nikoli pro jednotlivce.

Zaručujeme ti následující:

- Tvé údaje budou zpracovány anonymně.
- Účast v tomto výzkumu můžeš odmítnout nebo kdykoli ukončit bez udání důvodu – výzkum lze jednoduše ukončit zavřením prohlížeče.
- Účast v této studii tě nevystavuje žádným rizikům. Nebudou ti zobrazeny explicitní, citlivé nebo znepokojivé obsahy.

Pro více informací o výzkumu a tvé účasti v něm se můžeš obrátit na manažerku projektu: Mgr. Zuzana Podaná, Ph.D., Katedra sociologie, Filozofická fakulta Univerzity Karlovy, Nám. J. Palacha 2, 116 38 Praha 1, isrd@ff.cuni.cz.

Přečti si prosím následující a zaškrtni jedno z políček.

- Potvrzuji, že jsem byl/a informován/a o podmínkách účasti v této studii.
- Souhlasím s tím, že se studie zúčastním dobrovolně a mám právo svou účast kdykoli a bez udání důvodu zrušit.
- Beru na vědomí, že pokud budou moje informace použity ve vědecké publikaci, budou seskupeny s odpověďmi jiných lidí.

⁶ Official Czech translation

- Byl/a jsem informován/a, že ode mě nebudou shromažďovány žádné osobní identifikační údaje. Nikdo se nedozví, co jsem odpověděl/a.

* Prosím zvolte **pouze jednu** z následujících možností:

- Ano, souhlasím s podmínkami účasti a chci v účasti pokračovat.
- Ne, nesouhlasím s podmínkami účasti a chci svou účast nyní ukončit.

II Než začneš vyplňovat dotazník

Než začneš vyplňovat dotazník, vepiš prosím do pole číslo, které se ti zobrazí. Použij následující formát (bez mezer):

XXX-XX-X-XXX-XX *

Prosím napište svou odpověď zde:

III Nejprve několik otázek o tobě

1. Jsi...

Prosím zvolte **pouze jednu** z následujících možností:

- Muž
- Žena

2. Kolik je ti let?

Prosím napište svou odpověď zde:

X Tvůj názor

1. Do jaké míry souhlasíš nebo nesouhlasíš s následujícími výroky?

Prosím zvolte vhodnou odpověď pro každou z položek:

	Rozhodně souhlasím	Spíše souhlasím	Ani souhlasím, ani nesouhlasím	Spíše nesouhlasím	Rozhodně nesouhlasím
Jednám impulzivně, aniž bych u toho moc přemýšlel/a	○	○	○	○	○
Dělám to, co mi přináší okamžité uspokojení, třeba i za cenu obětování vzdálenějších cílů	○	○	○	○	○
Více mě zajímá, co se mi děje v současnosti, než co se mnou bude v budoucnosti	○	○	○	○	○
Rád/a občas testuji sám/sama sebe třeba nějakým trochu riskantním počinem	○	○	○	○	○

Někdy podstupuji riziko prostě proto, že mě to baví	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vzrušení a dobrodružství jsou pro mě důležitější než bezpečí	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

XI Věci, které občas mladí lidé dělají

Mladí lidé občas dělají zakázané věci, třeba něco zničí, někomu něco ukradnou, někdo občas někoho uhodí nebo mu záměrně ublíží (zde nemyslíme situace, kdy se mládež jen tak v žertu „pošťuchuje“). A co ty, udělal/a jsi někdy ve svém životě některou z následujících věcí?

Do pole vedle "Ano. Kolikrát za posledních 12 měsíců? Pokud nikdy v posledních 12 měsících, zadej "0". Mohou být vložena pouze čísla.

1. Pomaloval/a jsi někdy bez povolení zeď, vlak, metro nebo autobus (graffiti)?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

2. Poškodil/a jsi někdy úmyslně nějakou věc, třeba autobusovou zastávku, okno, auto nebo sedadlo ve vlaku či autobuse?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

3. Ukradl/a jsi někdy něco v obchodě nebo supermarketu?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

4. Vloupal/a ses někdy do domu nebo jiné budovy s cílem něco ukrást?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

5. Ukradl/a jsi někdy motorku nebo auto?

4. Vloupal/a ses někdy do domu nebo jiné budovy s cílem něco ukrást?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

6. Použil/a jsi někdy zbraň, násilí nebo hrozbu násilím k tomu, aby ti někdo vydal peníze nebo nějakou věc?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

7. Nosil/a jsi s sebou někdy zbraň, třeba hůl, obušek, nůž nebo pistoli pro vlastní ochranu nebo k napadení někoho jiného?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

8. Účastnil/a ses někdy skupinové bitky na ulici nebo na jiném veřejném místě, jako je nákupní centrum nebo sportovní stadion?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

9. Zbil/a jsi někdy někoho nebo někomu ublížil/a holí, obuškem, nožem či pistolí natolik vážně, že byl zraněn?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

10. Prodával/a jsi někdy drogy nebo někomu pomáhal/a prodávat drogy?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

11. Sdílel/a jsi někdy online intimní fotku nebo video někoho, kdo nechtěl, aby toto ostatní viděli?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

12. Poslal/a jsi někdy na sociálních sítích urážlivé zprávy nebo komentáře o něčí rase, etnické příslušnosti nebo národnosti, náboženství, genderové identitě, sexuální orientaci nebo z podobných důvodů?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

13. Použil/a jsi někdy internet, e-mail nebo sociální síť k podvedení nebo oklamání druhých (jako je phishing, prodej bezcenných nebo nelegálních věcí atd.), abys vydělal/a peníze?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

14. Hacknul/a jsi nebo naboural/a ses někdy do soukromého účtu nebo počítače za účelem získání dat, získání kontroly nad účtem nebo zničení dat?

Prosím zvolte **pouze jednu** z následujících možností:

Ne.

Ano:

Appendix C: Self-Control Scale⁷

How much do you agree or disagree with the following statements? The scale ranges from 1 (*Fully disagree*) to 5 (*Fully agree*).

1. I act on the spur of the moment without stopping to think
2. I do whatever brings me pleasure here and now, even at the cost of some future goal
3. I'm more concerned with what happens to me in the short run than in the long run
4. I like to test myself every now and then by doing something a little risky
5. Sometimes I will take a risk just for the fun of it
6. Excitement and adventure are more important to me than security

⁷ Excerpt from the ISRD-4 questionnaire in English

Appendix D: Invitation Letter

Original version:

Předmět: Mezinárodní výzkum ISRD 4 - Žádost o umožnění sběru dat

Vážený pane řediteli, vážená paní ředitelko,

ráda bych Vás požádala o spolupráci na výzkumu mládeže, který organizuje katedra sociologie Filozofické fakulty Univerzity Karlovy v rámci mezinárodního projektu ISRD4. Tento výzkum bezprostředně navazuje na tři mezinárodní šetření realizovaná v ČR v letech 1999, 2006 a 2013. Projekt nám pomůže získat informace o životě mladých lidí, jejich chování a problémových jevech, se kterými se mohou potkávat. Je tedy klíčovým podkladem k prohloubení vědomostí o příčinách takových jevů a možnostech prevence, opakovaný charakter výzkumu pak také umožňuje sledovat vývoj jednotlivých fenoménů v čase.

Vaše škola byla náhodně vybrána k účasti na tomto výzkumu. Jako člen týmu ISRD4 zodpovědný za sběr dat si Vás tedy dovoluji kontaktovat a požádat Vás o možnost realizace šetření ve třídách/ě X a Y. Šetření je zcela anonymní a nebudou zveřejňovány žádné výsledky za konkrétní žáky, třídy, ani školy.

V příloze prosím naleznete:

- dopis s dalšími podrobnostmi o výzkumu a jeho průběhu od hlavních řešitelů projektu doc. Jiřího Buriánka, CSc. a Mgr. Zuzany Podané, Ph.D.,
- dopis od mezinárodního řídicího výboru projektu ISRD (v angličtině),
- vyjádření podpory projektu od ředitelky odboru školství, mládeže a sportu MHMP
- vyjádření podpory projektu od Centra sociálních služeb Praha,
- vyjádření podpory projektu od Republikového výboru pro prevenci kriminality.

Školy, které se do šetření zapojí, od nás obdrží během podzimu souhrnnou zprávu s hlavními výsledky výzkumu. Zástupci těchto škol budou také pozváni na workshop k výstupům projektu.

Pokud byste potřeboval/a ještě nějaké další informace týkající se výzkumu a způsobu organizace sběru dat na Vaší škole, prosím uveďte laskavě kontakt (telefon, e-mail,...) Váš nebo pověřené osoby, rádi Vám zavoláme, případně se dostavíme k osobnímu jednání.

V případě, že s realizací výzkumu na Vaší škole souhlasíte, zašlete mi prosím kontakt na třídní/ho učitele daných tříd (xxx), resp. jinou pověřenou osobu, se kterým/i domluví termín návštěvy školy a další podrobnosti sběru dat.

Předem děkuji za spolupráci

S pozdravem

Bc. Tereza Vlčková
člen řešitelského týmu projektu ISRD4
Katedra sociologie FF UK
Tel.: +420 723 667 971
Email: vlckovatere@ff.cuni.cz
web projektu ISRD (v angličtině): isrdstudy.org/about-isrd

English translation:

Subject: International Research ISRD 4 - Request for Data Collection Permission

Dear Principal,

I would like to invite your cooperation in a youth research project organized by the Department of Sociology at the Faculty of Philosophy, Charles University, as part of the international ISRD4 project. This research directly follows three international surveys conducted in the Czech Republic in 1999, 2006, and 2013. The project will help us gather information about the lives of young people, their behavior, and the problematic phenomena they may encounter. It is thus a crucial basis for deepening knowledge of the causes of such phenomena and the possibilities for their prevention. The repeated nature of the research also allows us to monitor the development of various phenomena over time.

Your school has been randomly selected to participate in this research. As a member of the ISRD4 team responsible for data collection, I am therefore contacting you to request the possibility of conducting the survey in classes X and Y. The survey is completely anonymous, and no results will be published for specific students, classes, or schools.

Attached, please find:

- A letter with further details about the research and its process from the project's principal investigators, Assoc. Prof. Jiří Buriánek, CSc., and Mgr. Zuzana Podaná, Ph.D.,
- A letter from the international steering committee of the ISRD project (in English),
- An expression of support for the project from the Director of the Department of Education, Youth, and Sports of the Prague City Hall,
- An expression of support for the project from the Prague Social Services Center,
- An expression of support for the project from the Republican Committee for Crime Prevention.

Schools that participate in the survey will receive a comprehensive report with the main research findings during the autumn. Representatives of these schools will also be invited to a workshop on the project outcomes.

If you need any further information concerning the research and the organization of data collection at your school, please kindly provide the contact (telephone, email,...) of yourself or the designated person. We would be happy to call you or visit for a personal meeting.

If you agree to the implementation of the research at your school, please send me the contact information for the class teacher(s) of the specific classes (xxx), or another authorized person, with whom I will arrange the visit to the school and further details of the data collection.

Thank you in advance for your cooperation.

Best regards,

Bc. Tereza Vlčková

Member of the ISRD4 Project Research Team

Department of Sociology, Faculty of Philosophy, Charles University

Tel.: +420 723 667 971

Email: vlckovater@student.cuni.cz

ISRD project website (in English): isrdstudy.org/about-isrd

Appendix E: Opt-Out Parental Consent

Original version:

Vážení rodiče,

v současné době probíhá v České republice výzkum ISRD4 zajišťovaný Katedrou sociologie Filozofické fakulty Univerzity Karlovy, který je součástí mezinárodního výzkumného projektu zaměřeného na mládež, její životní styl, názory a aktivity, včetně zkušeností s projevy delikvence jak v prostředí internetu, tak mimo něj. Výsledky výzkumu přinesou aktuální informace o problémech, s nimiž se mohou mladí lidé v dnešní době potýkat, a poskytnou data pro preventivní strategie usilující o zvyšování jejich bezpečí. Výzkum je prováděn mezi přibližně 1800 studenty základních škol z 8.–9. ročníků (a jejich vrstevníky z víceletých gymnázií) a 1.–2. ročníků středních škol v Praze a Plzni a probíhá formou vyplňování on-line dotazníku v jejich třídě v rámci jedné školní hodiny.

Neboť Vaše dítě navštěvuje jednu z tříd, které byly pro tento výzkum náhodně vybrány, byli bychom rádi, aby se Váš/e syn/dcera do tohoto výzkumu také zapojil/a. Účast Vašeho dítěte je samozřejmě dobrovolná a veškeré údaje budou zcela anonymní. Získané informace budou použity pouze pro potřebu výzkumu a nebudou publikovány žádné výsledky týkající se jednotlivých žáků, tříd ani škol. Škola, kterou Vaše dítě navštěvuje, souhlasí se spoluprací na tomto výzkumu.

Doufáme, že Vám tento dopis poskytl potřebné informace; pokud byste však měli jakékoli otázky, můžete výzkumný tým kontaktovat emailem: sociologie@ff.cuni.cz. Jestliže z nějakého důvodu nesouhlasíte s tím, aby se Váš/e syn/dcera zúčastnil/a tohoto výzkumu, sdělte to prosím bezprostředně písemnou formou/emailem/... třídnímu učiteli/konkrétní osobě.

S pozdravem a poděkováním za spolupráci

doc. PhDr. Jiří Buriánek, CSc. & Mgr. Zuzana Podaná, Ph.D.
řešitelé projektu ISRD4 v ČR
webová stránka projektu ISRD4 (v angličtině): isrdstudy.org/about-isrd

English translation:

Dear Parents,

Currently, the ISRD4 research project, managed by the Department of Sociology at the Faculty of Philosophy, Charles University, is conducted in the Czech Republic. This project is part of an international research initiative focused on youth, their lifestyles, opinions, and activities, including experiences with delinquent behavior both online and offline. The results of the research will provide current information on the challenges young people face today and will supply data for preventive strategies aimed at increasing their safety. The research is being conducted among approximately 1800 elementary school students from grades 8–9 (and their peers from multi-year gymnasia) and 1st–2nd year high school students in Prague and Pilsen through an online questionnaire filled out in their classroom within one school hour.

As your child attends one of the randomly selected classes for this study, we would be pleased if your son/daughter could also participate in this research. Participation of your child is, of course, voluntary, and all data will be completely anonymous. The information obtained will

be used only for research purposes, and no results concerning individual students, classes, or schools will be published. The school your child attends has agreed to cooperate in this research.

We hope this letter has provided you with the necessary information; however, if you have any questions, you can contact the research team by email at sociologie@ff.cuni.cz. If for any reason you do not agree that your son/daughter should participate in this research, please immediately inform the class teacher/specific person in writing/by email.

With regards and thanks for your cooperation,

doc. PhDr. Jiří Buriánek, CSc., & Mgr. Zuzana Podaná, Ph.D.
Head of Researcher of the ISRD4 Project in the Czech Republic
ISRD4 project website (in English): isrdstudy.org/about-isrd

Appendix F: Assumptions for Performing Factorial ANOVA

Normality

In order to check the normality assumption of self-control scores, descriptive statistics were explored. As shown in Table F1, the kurtosis and skewness levels are close to 0 and fall within the acceptable range of -2 and + 2, indicating a normal distribution. The normality is further supported by the roughly bell-shaped curve in the histogram (Figure F1). The Shapiro-Wilk test was not used due to its sensitivity to large sample sizes, which can lead to falsely significant results. Based on these results, we conclude that the assumption of normality was not violated.

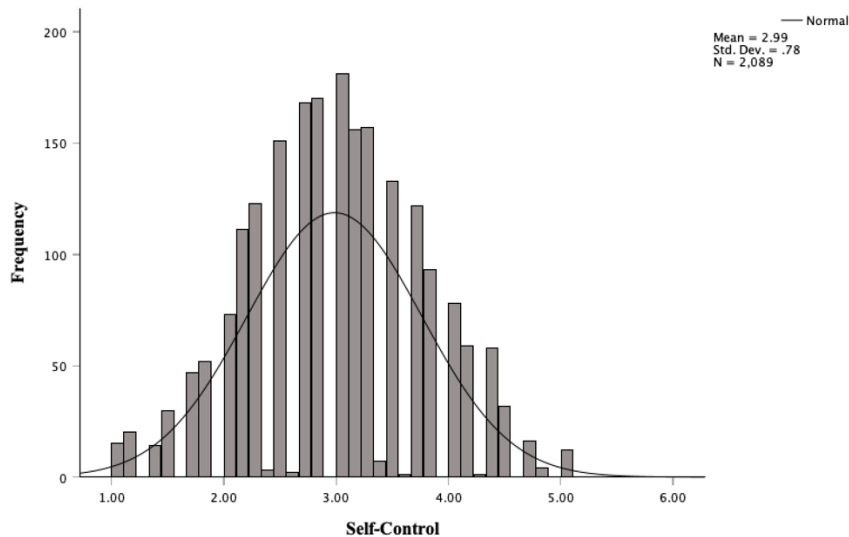
Table F1

Descriptive statistics of self-control

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Self-Control	2089	2.99	.78	-.02	.05	-.28	.11
Valid N (listwise)	2089						

Figure F1

Self-Control Scores Distribution



Homogeneity of variances

The Levene's Test for Equality of Variances was used to check the assumption of homogeneity of variances for self-control scores across sexes and school type groups. Therefore, the following hypotheses were investigated: H_0 = Homogeneity of variances holds; H_A : Homogeneity of variances does not hold.

As shown in Table F2 below, the test result indicated equal variances ($F = 1.38, p = .192$). Thus, the assumption of homogeneity of variances was met, i.e., the null hypothesis was retained.

Table F2

Levene's Test of Equality of Variances in self-control^a

F	df1	df2	Sig.
1.38	9	2079	.19

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

^a Design: Intercept + sex + schtype

Independence of residuals

The independence of errors is assumed to be met based on the study design and thorough data collection procedure.

Appendix G: Assumptions for Performing Logistic Regression

Linearity

The assumption of linearity applies to continuous independent variables and hence a potential linear relation between logit of the criterion and our continuous predictor, self-control, had to be checked. Firstly, log of the self-control variable was computed. Secondly, a binary regression model was fitted (method Enter) to see whether there is an interaction between the predictor and its log. The interaction effect for the predictor, self-control, and its log was found nonsignificant ($p = .053$). Thus, the violation of linearity is not violated. See the results outlined in Table G1.

Table G1

Binary logistic regression model to check the linearity assumption

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a	Self-Control	-15.729	7.472	4.431	1	.035	.000
	Log SelfControl	13.007	6.151	4.471	1	.034	445668.412
	Log SelfControl by Self-Control	4.971	2.567	3.750	1	.053	144.138
	Constant	15.228	7.211	4.459	1	.035	4106339.792

^a Variable(s) entered on step 1: SelfControl_Mean, LogSelfControl, LogSelfControl * SelfControl_Mean .

Multicollinearity

In order to check the assumption of multicollinearity a linear regression was performed with the same criterion as well as predictor. Table G2 shows results of the collinearity diagnostics that indicate the assumption of multicollinearity was not violated, as VIF is < 10 and tolerance is $> .2$. Same results were obtained with Cybercrime indicator as a dependent variable.

Table G2

Colinearity diagnostics

Coefficients^a

Model		Collinearity Statistics	
		Tolerance	VIF
1	Self-Control	1.000	1.000

^a Dependent Variable: Traditional delinquency

Influential cases

To check for influential cases, the influence of each case on the regression model parameters needs to be calculated. In order for the assumption to be met, Cook's distances must be < 1 . Cook's distances were checked and no influential cases were identified, see Table G3.

Table G3

Descriptive statistics of the Cook's distances

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Analog of Cook's influence statistics	2089	.00009	.02594	.0009689	.00176133	5.502	.054	52.281	.107
Valid N (listwise)	2089								

Independence of residuals

We further assume the independence of errors based on the study design and thorough data collection procedure.