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Multidimenzionální analýza impulzivity u respondentů s antisociální poruchou osobnosti a komorbidní ADHD poruchou ve vězeňském prostředí

Kateřina Příhodová, M.A.

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Předseda oborové rady: prof. PhDr. Et. PhDr. Radek Ptáček, Ph.D.
doc. MUDr. Martin Anders, Ph.D.

Školící pracoviště: Psychiatrický klinika 1. LF UK a VFN v Praze

Školitel: prof. MUDr. Jan Vevera, Ph.D.

Disertační práce bude nejméně pět pracovních dnů před konáním obhajoby zveřejněna k nahlížení veřejnosti v tištěné podobě na Oddělení pro vědeckou činnost a zahraniční styky Děkanátu 1. lékařské fakulty.

ABSTRAKT

Impulzivita hraje důležitou roli u mnoha poruch chování, zejména u populace vězněných osob. Prevalence násilí ve věznicích je častější a narůstá. Různé teorie agresivity se pokoušely o vysvětlení specifických modelů, struktur a prediktorů agresivního chování, kde impulzivita byla často citována jako důležitý faktor násilí. Současná studie porovnála sebesuzovací dotazníky impulzivity a agresivity u vězeňské a obecné populace. Analýzy ukázaly na signifikantně vyšší míru impulzivity u vězeňské populace, zejména u motorické impulzivity a neschopnosti plánovat dopředu, ukvapeném jednání založeném na emocích a u impulzivity vůči fyzickým potěšením, sociálním interakcím a penězům. Výsledky dále poukázaly na impulzivitě jako silný prediktor agrese v obou skupinách, konkrétně z hlediska chování pod vlivem silných emocí. Další proměnnou, která byla pro vzorek vězeňské populace zajímavá, byly nedostatky ve svědomitosti. Doporučení pro prevenci, léčbu a budoucí směřování jsou v rámci diskuze také součástí této práce.

Klíčová slova: impulzivita, vězeňská populace, BIS-11, DGI, UPPS-P, BPAQ, agresivita

ABSTRACT

Impulsivity tends to play an important role in many behavioral disorders, especially in the population of incarcerated offenders, where the prevalence of impulsivity is expected to be high. Furthermore, the prevalence of prison violence is steadily increasing. Different theories of aggression attempted to explain and introduce specific models, structures, and predictors of aggressive behaviors, where impulsivity has been frequently cited as an important factor to violence. Thus, the current study compared self-reported measures of impulsivity and aggression in a prison population sample and a non-prison control group. Analyses pointed toward significantly higher levels of impulsivity in the prison population sample, particularly in terms of motor and non-planning impulsivity, emotion based rash action and sensation seeking, and impulsivity toward physical pleasures, social interactions and money. Moreover, the results showed impulsivity as a strong predictor of aggression in both groups, specifically in terms of the Emotion-based Rash Action. Another variable of interest for the prison population sample was Deficits in Conscientiousness. The recommendation for prevention/treatment efforts and future directions are also discussed in the article.

Key words: impulsivity, prison sample, BIS-11, DGI, UPPS-P, BPAQ, aggression

Introduction

Impulsivity

Impulsivity is often operationalized in various definitions. As a multidimensional construct that subsumes a number of behavioral features, impulsivity can range from impatience, indifference to the consequences to one's behavior or the inability to suppress inappropriate behavior (Ainslie, 1975; Barratt & Patton, 1983; Eysenck, 1993; Reynolds, Ortengen, Richards & de Wit, 2006). Impulsivity has been studied in different populations, predominantly general and clinical populations, for its potentially desirable and detrimental qualities. It is integrated in many diagnostic criteria for psychiatric and personality disorders (DSM-5, American Psychiatric Association, 2013).

Mitchell and Potenza (2014) described three types of impulsivity: self-reported impulsivity (general impulsivity measure or personality trait), response impulsivity or response inhibition (inability to withhold a proponent response; diminished control over action cancellation) and choice impulsivity (inability to delay gratification for a larger payout, also including risky behaviors and sensitivity to risk). Each of these behaviors appears to be associated with multiple brain regions, such as the temporal lobe (Fineberg et al., 2014; Mitchell & Potenza, 2014) and the frontal lobe (Bari & Robbins, 2013; Fineberg et al., 2014). These three facets of impulsivity tend to load independently on factor analyses in both human and animal studies (Broos et al., 2012).

Impulsivity has been frequently referenced in etiological theories of crime and criminal behaviors (Gottfredson & Hirschi, 1990; White et al. 1994). A recent systematic review confirmed that individual personality traits, such as psychopathy, low self-control (impulsivity), and difficult temperament (evidenced primarily by adverse childhood experiences and temperament factors related to poor emotional self-control) all contribute to criminality (Tarshini et al., 2021).

Although a number of studies evaluated impulsivity in the forensic setting, the assessment of impulsivity was viewed in the unidimensional context, regardless of the theoretical multidimensional construct and the higher prevalence of pathological impulsivity in this population (Bernstein et al., 2015; Fazel et al., 2016; Tonnaer et al., 2016; Værøy, 2016; Warren et al., 2012). There is, for example, a strong relationship between impulsivity, institutional aggression and prison adjustment, where results showed that impulsivity was a stronger predictor of aggression in comparison to ethnicity or index violent offense, and contributed to the difficulties in institutional adjustment (Fornells, Capdevila, & Andres-Pueyo, 2002; Wang, & Diamond, 1999). In correctional settings, different facets of impulsivity are therefore associated with different problematic behaviors, including breaches of discipline (Gordon & Egan, 2011), physical aggression between inmates or toward correctional staff (Værøy, Western & Andersson, 2016), and self-harm (Gvion & Apter, 2011).

Thus, advanced understanding and detection of risk factors related to impulsivity can better inform both treatment needs and requirements in this population, and as a result lead to increased safety of the prison environment, and potentially reduce institutional infractions during incarceration (Fazel et al., 2016). However, the role of impulsivity in maladaptive or deviant behaviors remains unclear, predominantly due to the disagreements and inconsistencies in literature about how to define, operationalize, and measure this construct.

Impulsivity and Aggression

Using the Five Factor Model (FFM) of personality as assessed by the NEO-PI-R (Costa & McCrae, 1992), Whiteside and Lynam (2001) identified four impulsivity-like personality traits indicating unique pathways to impulsive behavior that were based on the Neuroticism, Extraversion, and Conscientiousness factors. The impulsivity-like personality traits included: (negative) urgency, defined as the tendency to act rashly under negative emotion; sensation seeking, defined as the need to seek excitement; (lack of) premeditation,

defined as the ability to plan prior to taking an action; and (lack of) perseverance, defined as the ability to persist in the task upon its completion. Additional research later identified positive urgency or the tendency to act rashly under positive emotion, as a distinct factor contributing to impulsivity, leading to the five-factor model of impulsivity (Cyders & Smith, 2007).

Studies of the four/five-factor UPPS-P impulsivity model focused on its connection to psychopathology and risky behaviors, such as alcohol use and misuse (Coskunpinar et al., 2013), addiction related behaviors (Rømer Thomsen et al., 2018), Borderline Personality Disorder, ADHD, eating problems and risky sexual behaviors (Miller et al., 2003), or self-harm and non-suicidal self-injury (Dir et al., 2013). Several studies also examined the association between these impulsivity factors and violent behaviors or aggression.

In term of violence and aggression, lack of premeditation and sensation seeking were identified as important factors associated with general violence, while emotion based rash action (positive and negative urgency) predicted behaviors related to intimate partner violence (Derefinko, 2012). Likewise, Miller, Zeichner, and Wilson (2012) recognized conscientiousness-based impulsivity and neuroticism-related forms of impulsivity as important correlates of aggression. Specifically, a strong relationship between impulsivity and aggression, displayed by hostility or anger, was found in inmates sentenced for violent crimes, such as murder, attempted murder or violent crimes with sex-related components, while the level of urgency was identified as an important factor that increased the likelihood of committing violent crimes (Værøy, Western & Andersson, 2016).

[The Attention Deficit Hyperactivity Disorder](#)

According to the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association [APA], 2013), the Attention-Deficit Hyperactivity Disorder, which is categorized under the neurodevelopmental disorders, is mainly characterized by inattention, hyperactivity, and/or impulsiveness. Inattention within this context is described as “wandering

off task, lacking persistence, having difficulty sustaining focus, and being disorganized,” while impulsivity “refers to hasty actions that occur in the moment without forethought and that have high potential for harm to the individual” or “desire for immediate rewards or an inability to delay gratification” or “as social intrusiveness (e.g., interrupting others excessively) and/or making important decisions without consideration of long-term consequences (e.g., taking a job without adequate information)” (APA, 2013, p. 61).

In the International Classification of Diseases (ICD-10) (World Health Organization [WHO], 1992) ADHD is categorized under the Hyperkinetic Disorders in the Disturbance of Activity and Attention Section. The descriptions of impulsivity in the ICD-10 involve “a lack of persistence in activities that require cognitive involvement, and a tendency to move from one activity to another without completing any one, together with disorganized, ill-regulated, and excessive activity” (WHO, 1992). The ICD-11 adjusted the definition of impulsivity to “a tendency to act in response to immediate stimuli, without deliberation or consideration of the risks and consequences” (WHO, 2022).

Only in recent years have researchers started to conduct multidimensional analyses of impulsivity for specific diagnoses. For example, Lopez, Dauvilliers, Jaussent, Billieux, and Bayard (2015) studied various dimensions of impulsivity in adults diagnosed with ADHD and its different subtypes using the Conner’s Adult ADHD Rating Scale-Self-Report: Short Version (CAARS-S:S) and the UPPS Impulsive Behavior Scale. The results showed that participants diagnosed with ADHD received higher scores on urgency, lack of premeditation, and lack of perseverance. With regard to the different subtypes of ADHD, this study showed that patients diagnosed with the combined type of ADHD obtained higher scores on the urgency and sensation-seeking scales in comparison to patients diagnosed with the predominantly inattentive type, suggesting that patients with the combined type of ADHD

may show poorer response inhibition as well as poorer decision making in emotional situations (Lopez et al., 2015).

Similarly, Malloy-Dinitz, Fuentes, Leite, Correa, and Bechara (2007) examined the presence of the three dimensions of impulsivity: attentional, non-planning, and motor impulsivity (according to the concepts of Barratt and Bechara) in adult patients with ADHD using self-report measures as well as behavioral measures of impulsivity. The results of this study showed that patients with ADHD differed on all three dimensions of impulsivity in comparison to a matched control group. According to the results from these studies, patients diagnosed with ADHD have a tendency to obtain higher scores across different measures of impulsivity in comparison to healthy control groups. Nevertheless, participants for these studies were recruited predominantly from clinical and general populations.

The Prison population

A meta-analysis of the prevalence of ADHD within the inmate population showed that the highest estimated prevalence of this disorder was observed in Europe (32.1%), followed by North America (26.9%), and other Countries (17.6%) (Young et al., 2015). No significant differences were found in gender. The estimated prevalence of ADHD for male inmates was 30.3%, while the estimated prevalence for female inmates was 26.2%. Surprisingly, no significant differences were found for age in this population, where the estimated prevalence for youth was 30.1%, while the estimated prevalence for adults was 26.2% (Young et al., 2015).

Another common diagnosis for the population of incarcerated offenders is the Antisocial Personality Disorder. In a systematic review performed by Fazel and Danesh (2002), 47% of convicted male offenders and 21% of convicted female offenders were diagnosed with Antisocial Personality Disorder (APD). Furthermore, violent offenders diagnosed with APD were shown to have higher scores of impulsiveness and aggression in comparison to nonviolent offenders diagnosed with APD (De Tribolet-Hardy et al., 2011).

With regard to the comorbidity of this diagnosis with ADHD, Black et al. (2010) conducted a study on 320 newly incarcerated offenders, and found that the diagnosis of Antisocial Personality Disorder was present in 35.3% of inmates, while 33% of these inmates had a comorbid ADHD diagnosis.

Goals and Hypotheses

Based on the theoretical concepts and limitations in the empirical research, the purpose of the current study was to analyze the multidimensional nature of impulsivity in a prison population sample and compare its various facets to a non-prison population sample.

Referring to the results of previous studies, the authors anticipated to observe significantly higher scores of impulsivity in the prison population. As demographic variables (such as gender, age, and educational attainment) were expected to be associated with both levels of impulsivity and the target population (prisoners), the analyses were adjusted to the demographic confounders.

Furthermore, the goal was to assess the five-factor model of impulsivity and self-reported aggression in a prison population sample and compare its relationship to a non-prison population sample. According to the available research, the authors anticipated to observe significantly higher scores for the prison population in terms of impulsivity, primarily in the domain of emotion based rash action, and aggressiveness, while the relationship was expected to be mediated by urgency.

Likewise, the analyses compared prisoners that satisfied the primary criteria for the Attention-Deficit Hyperactivity Disorder as determined by the adult ADHD self-report scale and the levels of various impulsivity domains operationalized by self-reported measures the UPPS-P, DGI, and BIS-11. The authors anticipated to observe significantly higher scores of impulsivity In the ADHD prisoner group.

Methodology

Participants

Inmates were recruited from 12 participating prisons that represent 34% of the total number of prisons in the Czech Republic. The identified criminal activities ranged from property crimes (e.g. theft, fraud, obstruction of justice) to violent crimes/felonies (e.g. robbery, grievous bodily harm, attempted murder or murder). Participating inmates were classified as medium or maximum security level, according to the duration of the sentence, the criminal nature (violence, drugs, and sex crimes), and the number of previous incarcerations. The majority of the participating inmates were males (63%). All participants were at least 18 years of age. The mean age of the sample was 35.7 years ($SD = 12.0$). In terms of their educational attainment, most inmates received only primary education (50.7%) or some type of vocational training (38.2%).

Participants for the control group were recruited from a community sample in Prague via news-paper advertisements, fliers, and social media platforms. All participants were at least 18 years of age. The mean age of the sample was 41.7 years ($SD = 15.8$). The majority of this sample graduated from high school (40.5%), obtained a university degree (35.4%), or received some type of vocational training (19.0%).

Ethics

The research was approved by the Ethics Committee of the National Institute of Mental Health in the Czech Republic (registered ID: 17-05791S). Prior to participating in the study, all participants signed an informed consent.

Measures

The Barratt Impulsiveness Scale (BIS-11)

The BIS-11 is a 30-item measure of impulsiveness defined by six first-order factors (attention, cognitive instability, motor, perseverance, self-control, cognitive complexity) and

three second-order factors (attentional, motor, nonplanning). Items are scored on a 4-point Likert-type scale (Patton et al., 1995).

Internal consistencies of all subscales, measured by Cronbach's α , were above 0.7 with the exception of motor impulsivity (from the second order factorial structure) and cognitive complexity, perseverance and cognitive instability (from the first order factorial structure). The test-retest reliability showed varying strengths, however, all correlations were statistically significant at the level $p \leq 0.01$ (Stanford et al., 2009).

The original structure of motor and attentional impulsiveness showed low internal consistency in forensic psychiatric patients (Haden & Shiva, 2008). Therefore, other alternative factor models of impulsivity were proposed by different authors (Haden & Shiva, 2008; Ruiz et al., 2010).

The Delay of Gratification Inventory (DGI)

The DGI is a 35-item measure with a 5-point Likert-type scale. This inventory defines impulsivity in terms of five domains of delayed behavior: i) food, ii) physical pleasures or the avoidance of unpleasantness, iii) social interactions, iv) money, and v) achievement. The psychometric properties of these domains were supported in terms of both internal consistency and test-retest reliability. Namely, the internal consistency ranging from 0.71–0.85, independently of gender or location, and the test-retest reliability across all factors, ranging from $r = 0.74$ – 0.90 . Construct validity showed significant correlations with psychopathologic and adjustment impulsivity measures (Hoerger et al., 2011).

The UPPS-P Impulsive Behavior Scale

The UPPS-P is a 59-item measure of five different factors of impulsivity: i) positive urgency, ii) negative urgency, iii) sensation seeking, iv) lack of perseverance, and v) lack of premeditation. Items are scored on a 4-point Likert-type scale (Whiteside & Lynam, 2001).

This instrument has been supported as a consistent and valid measure of impulsivity in clinical settings, particularly for disorders containing impulsiveness (Savvidou et al., 2017).

The Buss-Perry Aggression Questionnaire Short-Form (BPAQ-SF)

The BPAQ-SF is a 12-item self-report measure of aggression defined by physical aggression, verbal aggression, anger and hostility with GFI = 0,94 (Bryant & Smith, 2001). Items are scored on 5-point Likert type scale ranging from 1 (*very unlike me*) to 5 (*very like me*). Studies showed good psychometric properties of this measure in general population of offenders, while the confirmatory factor analysis supported the original four factor structure (Diamond & Magaletta, 2006).

The Adult ADHD Self-Report Scale (ASRS)

A self-report questionnaire developed by the World Health Organization (WHO) evaluating the occurrence of ADHD symptoms in adults. The ASRS is an 18-item measure scored on a Likert type scale ranging from 'never' to 'very often'. Studies have shown good psychometric properties of this measure with high internal consistency and validity (Adler et al., 2006).

Results

Impulsivity measures

Table 1 provides demographic characteristic of the participants, presented separately by the study group (target prisoners, control group) and for the total sample. Altogether, $N = 223$ individuals were included into the study; about two-thirds of the respondents were recruited from the target prison population ($N_I = 144$; 65%), and one-third from the non-prison control group ($N_0 = 79$; 35%). Comparing demographics between the two study groups, the prisoners were characterized by significantly higher share of males [$\chi^2(1) = 33.34$, $p < .001$], lower educational attainment [$\chi^2(3) = 104.17$, $p < .001$], and younger age [$t(221) =$

3.20, $p < .001$] than the participants from the control group. The demographic structure of the sample, as described in Table 1, was therefore used in calculating the correlation matrix.

Table 1

Table 2 provides descriptive statistics and p -values of the key measures of impulsivity and their partial domains consecutively for *BIS-11* through *UPPS-P* stratified by sample and gender. As the psychometric scores were computed as a mean of Likert-type responses of an individual across the set of items of a domain, the range of descriptive statistics averaged across all the individuals is also bounded within the same range of values. Namely, as the items of domains for *BIS-11* and *UPPS-P* used a four-point Likert scale, the descriptive statistics in Table 2 range between 1.0 and 4.0. Likewise, as the items of the *DGI* applied a five-point scale, the psychometric scores of its domains are bounded by 1.0 and 5.0. Some of the respondents, particularly those from the prison group, refused to fill out or did not complete all three questionnaires on impulsivity. Therefore, the total number of observations for each of the measures was lower than the total sample size and varied between $N_{BIS} = 88$ and $N_{UPPS} = 79$ for male prisoners, and between $N_{BIS} = 53$ and $N_{UPPS} = 39$ for female prisoners.

Table 2

In Table 2, pairwise comparisons of the mean domain scores stratified by group (prisoners vs. controls) and gender are presented. Here, mean values are compared between the groups. The comparisons are presented consecutively for each of the domains and measures of impulsivity. For most of the domains in Table 2, the mean comparisons

specifying only sample as the grouping variable point to a significantly higher level of impulsiveness among the target group as compared to the controls. When introducing also gender as a grouping variable, the greatest number of significant differences across domains is visible between female prisoners and controls followed by female prisoners and male controls; interestingly, there were not as many significant differences between male prisoners and controls.

The correlation matrix of the three measures of impulsivity (particularly their domains) and age, gender, and education is available in Table 3. In the prisoners' group, the majority of the significant associations ($rho < .05$) were observable between the three impulsivity measures and age, whereas the least amount of measures were correlated with education. For age and educational level, all of the significant correlations were negative, whereas for gender the significant correlations were positive. Comparably to the target group, in the control group the majority of the significant associations ($rho < .05$) were observable between the three measures of impulsivity and age of the participants; yet, the least amount of significant correlations was between the impulsivity measures and gender of the participants. As for the prisoners' group, age and education were negatively correlated with the domains of the three measures of impulsivity. Furthermore, gender was positively correlated with Negative Urgency (*UPPS-P*), but negatively correlated with Sensation Seeking (also *UPPS-P*).

Table 3

Table 1. Demographic characteristics of the dataset, by the study group.

Categorical variables		Group				Total (N=223)	
		Prisoners (N ₁ =144)		Control group (N ₀ =79)			
		%	n	%	n	%	n
Gender	Males	63.2%	91	22.8%	18	48.9%	109
	Females	36.8%	53	77.2%	61	51.1%	114
Educational attainment	Primary	50.7%	73	5.1%	4	34.5%	77
	Secondary lower	38.2%	55	19.0%	15	31.4%	70
	Secondary upper	9.7%	14	40.5%	32	20.6%	46
	University	1.4%	2	35.4%	28	13.5%	30
Scale variable		Mean (Std. dev.)	Min. – Max.	Mean (Std. dev.)	Min. – Max.	Mean (Std. dev.)	Min. – Max.
Age		35.7 (12.0)	19 – 72	41.7 (15.8)	18 – 83	37.8 (13.7)	18 – 83

Table 2. Descriptive statistics and p -values of the input measures on impulsiveness.

	Mean				Std. dev.				p -Tukey							
	Prisoners		Control		Prisoners		Control		Group	Gender	M _c ×F _c	M _c ×M _p	M _c ×F _p	F _c ×M _p	F _c ×F _p	M _p ×F _p
	Males	Females	Males	Females	Males	Females	Males	Females								
BIS-11	<i>N</i> =88	<i>N</i> =53	<i>N</i> =18	<i>N</i> =61	<i>N</i> =88	<i>N</i> =53	<i>N</i> =18	<i>N</i> =61								
Attention 1'OF	2.13	2.33	1.98	2.23	0.570	0.696	0.609	0.530	.184	.020*	.406	.758	.139	.764	.798	.223
Cognitive Instability 1'OF	1.88	1.97	1.57	1.82	0.685	0.600	0.456	0.613	.024*	.101	.480	.244	.102	.933	.572	.845
Attentional 2'OF	2.04	2.20	1.83	2.07	0.517	0.610	0.464	0.487	.052	.018*	.309	.423	.056	.975	.617	.319
Motor 1'OF	2.03	2.27	1.75	1.96	0.514	0.567	0.369	0.532	<.001*	.010*	.476	.164	.002*	.802	.009*	.054
Perseverance 1'OF	2.01	2.12	1.68	1.76	0.568	0.596	0.319	0.378	<.001*	.259	.934	.060	.011*	.018*	.002*	.650
Motor 2'OF	2.03	2.21	1.73	1.89	0.457	0.516	0.292	0.414	<.001*	.018*	.557	.053	<.001*	.240	<.001*	.085
Self-Control 1'OF	2.42	2.61	1.99	2.21	0.561	0.608	0.415	0.544	<.001*	.022*	.475	.018*	<.001*	.108	<.001*	.187
Cognitive Complexity 1'OF	2.60	2.63	2.13	2.32	0.518	0.570	0.434	0.479	<.001*	.204	.525	.003*	.003*	.006*	.010*	.995
Nonplanning 2'OF	2.50	2.62	2.06	2.26	0.472	0.558	0.381	0.431	<.001*	.037*	.387	.002*	<.001*	.013*	<.001*	.503
DGI	<i>N</i> =80	<i>N</i> =39	<i>N</i> =18	<i>N</i> =56	<i>N</i> =80	<i>N</i> =39	<i>N</i> =18	<i>N</i> =56								
Food	2.84	2.88	2.59	2.82	0.634	0.844	0.746	0.915	.235	.305	.677	.584	.564	.999	.989	.997
Physical	2.78	2.68	2.60	2.53	0.635	0.672	0.536	0.569	.106	.389	.970	.674	.970	.084	.632	.829
Social	2.93	2.77	2.65	2.60	0.558	0.640	0.465	0.556	.018*	.276	.991	.226	.874	.006*	.487	.468
Money	2.61	2.94	1.82	2.12	0.833	1.119	0.534	0.910	<.001*	.036*	.610	.005*	<.001*	.011*	<.001*	.230
Achievement	2.82	2.92	2.75	2.68	0.625	0.906	0.579	0.677	.181	.915	.985	.975	.831	.638	.369	.906
UPPS-P	<i>N</i> =79	<i>N</i> =39	<i>N</i> =18	<i>N</i> =59	<i>N</i> =79	<i>N</i> =39	<i>N</i> =18	<i>N</i> =59								
Negative Urgency	2.59	2.81	1.99	2.28	0.626	0.802	0.593	0.594	<.001*	.021*	.359	.003*	<.001*	.032*	<.001*	.332
Positive Urgency	2.38	2.77	1.83	1.86	0.618	0.753	0.592	0.667	<.001*	.059	.998	.008*	<.001*	<.001*	<.001*	.017*
Emotion Based Rash Action 2'OF	2.48	2.79	1.91	2.07	0.548	0.716	0.570	0.570	<.001*	.021*	.750	.001*	<.001*	<.001*	<.001*	.050*
Sensation Seeking 2'OF	2.89	2.84	2.66	2.02	0.676	0.886	0.488	0.830	<.001*	.007*	.010*	.666	.848	<.001*	<.001*	.987
(Lack of) Premeditation	1.98	2.18	1.88	2.03	0.599	0.933	0.412	0.625	.258	.124	.854	.943	.401	.979	.679	.422
(Lack of) Perseverance	1.88	2.08	1.85	1.98	0.542	0.744	0.402	0.553	.498	.083	.829	.997	.492	.732	.835	.280
Deficits in Conscientiousness 'OF	1.93	2.13	1.87	2.01	0.492	0.757	0.333	0.530	.298	.066	.788	.970	.332	.864	.679	.247

Note. The *BIS-11*, *DGI*, and *UPPS-P* domains are measures of impulsive behavior. Higher scores indicate higher levels of impulsivity. * = Statistically significant; M_c = male controls; M_p = male prisoners; F_c = female control; F_p = female prisoners.

The 2'OF states for a second-order domain, consisting of two first-order domains. The *UPPS-P* domain on *Sensation Seeking* acted as both first-order and second-order score, consisting of 12 items.

Table 3. Spearman rank correlation coefficients of the BIS-11, DGI, and UPPS-P domains scores with demographic confounders

	Prisoners (N = 141)						Control (N = 79)					
	Age		Gender		Education		Age		Gender		Education	
	<i>rho</i>	<i>p</i> -value	<i>rho</i>	<i>p</i> -value	<i>rho</i>	<i>p</i> -value	<i>rho</i>	<i>p</i> -value	<i>rho</i>	<i>p</i> -value	<i>rho</i>	<i>p</i> -value
BIS-11												
Attention 1'OF	-.183	.030*	.135	.110	-.024	.781	-.169	.136	.178	.117	-.016	.888
Cognitive Instability 1'OF	-.363	< .001*	.102	.228	-.065	.411	-.224	.047*	.173	.127	.078	.492
Attentional 2'OF	-.264	.002*	.124	.144	-.046	.587	-.219	.054	.206	.069	.047	.681
Motor 1'OF	-.245	.003*	.215	.010*	-.120	.157	-.208	.065	.172	.130	.057	.616
Perseverance 1'OF	-.136	.107	.090	.288	.013	.879	-.222	.050*	.121	.289	-.014	.902
Motor 2'OF	-.220	.009*	.171	.043*	-.080	.346	-.280	.012*	.149	.190	.041	.718
Self-Control 1'OF	-.201	.017*	.170	.044*	-.176	.037*	-.121	.289	.154	.176	-.024	.836
Cognitive Complexity 1'OF	-.367	< .001*	.023	.790	-.142	.093	-.149	.189	.170	.135	-.233	.039*
Nonplanning 2'OF	-.308	< .001*	.128	.130	-.182	.031*	-.153	.177	.182	.108	-.112	.324
DGI												
Food	-.243	.008*	-.093	.602	-.093	.313	-.048	.684	.136	.248	.149	.206
Physical	-.149	.105	-.078	.400	.028	.763	-.266	.022*	-.053	.656	.084	.476
Social	-.071	.446	-.114	.217	.073	.431	.064	.589	-.070	.556	-.233	.045*
Money	-.295	.001*	.144	.118	-.031	.741	-.276	.017*	.107	.363	-.045	.705
Achievement	-.076	.412	.006	.946	-.219	.017*	-.172	.144	-.030	.797	-.246	.035*
UPPS-P												
Negative Urgency	-.119	.199	.123	.184	-.078	.403	-.139	.229	.254	.026*	.014	.906
Positive Urgency	-.056	.544	.244	.008*	.049	.597	-.097	.399	.001	.990	.050	.668
Emotion Based Rash Action 2'OF	-.106	.254	.203	.027*	-.015	.873	-.115	.318	.146	.206	.062	.594
Sensation Seeking 2'OF	-.264	.004*	-.011	.905	.107	.249	-.452	< .001*	-.357	.001*	.116	.317
(Lack of) Premeditation	-.161	.082	.050	.594	-.045	.631	-.270	.017*	.093	.423	.045	.697
(Lack of) Perseverance	-.160	.084	.121	.191	-.020	.830	-.217	.058	.087	.454	-.051	.662
Deficits in Conscientiousness 2'OF	-.186	.043*	.086	.353	-.038	.685	-.277	.015*	.084	.466	.009	.936

Note. * = Statistically significant.

Impulsivity and Aggression

Referring to the mean values of the BPAQ-SF domains of aggression, the prisoners were characterized by a significantly higher level of aggression in comparison to the non-prison control group. This can be formally documented by *t*-test on the between-group differences of the total aggression score as well as its 1st-order domains (physical through hostility); two-sample *t*-tests with unequal variances: Total score ($t=6.047$, $d.f.=193$, $p<0.001$), Physical ($t=6.214$, $d.f.=193$, $p<0.001$), Verbal ($t=3.610$, $d.f.=193$, $p<0.001$), Anger ($t=3.196$, $d.f.=193$, $p=0.002$), Hostility ($t=6.870$, $d.f.=193$, $p<0.001$). Similarly, mean scores on the domains of impulsivity in the prisoners were higher; particularly in the UPPS-P domains of Emotion-based Rash Action and Sensation Seeking. However, no between-group differences were found in the Deficits in Conscientiousness and its two 1st-order domains (lack of premeditation and lack of perseverance).

In Table 2, pairwise relationship between the domains of aggression and impulsivity are presented, quantified by the Spearman's rank correlation coefficients. This non-parametric coefficient is robust against the deviations of the data from a theoretical normal (Gaussian) distribution. However, it is unable to provide correlations adjusted for a set of presumable confounders. Therefore, the pairwise correlations in Table 2 are rather descriptive in nature and serve as a starting point for next steps of the analysis. Nevertheless, most of the pairwise correlations between the BPAQ-SF and UPPS-P domains are substantial in terms of both their magnitude and associated *p*-values. This is particularly notable for the correlations between the UPPS-P domains of Emotion-based Rash Action (both 1st order and 2nd order) with aggression among both the group of prisoners and the non-prison comparison group. However, there are also some relatively low and non-significant correlations as well, particularly for the pairwise relationship between Sensation Seeking and domains of aggression in the non-prison comparison group.

Table 3 presents partial correlation coefficients between UPPS-P and BPAQ-SF domains controlled for socio-demographic variables and adjusted for the selected confounders that played significant role in this relationship. Namely, higher-order partial correlations that are presented and adjusted for age, gender, and educational attainment of the participants. The analytical outputs were again derived separately for the target group of prisoners and for the non-prison comparison group.

Comparing the multiple-adjusted partial correlations in Table 3 and in Table 2, both outputs of the correlation analyses provide similar results. Although the correlation coefficients in Table 3 are lower in their magnitude, the results point to a strong relationship particularly between the UPPS-P domains of Emotion-based Rash Action with all of the BPAQ-SF domains of aggression among both group of prisoners and non-prison comparison group. Next to the Emotion-Based Rash Action, the partial correlations of Deficits in Conscientiousness (both 1st and 2nd order) with aggression are also substantial; particularly among the target group of prisoners, where all partial correlations are significant and exceed 0.200 for individual BPAQ-SF domains, and eventually 0.300 for the Total score. In contrast to the group of prisoners, the partial correlations of Deficits in Conscientiousness in the non-prison comparison group with domains of BPAQ-SF are not quite consistent; some correlations are significant (Lack of perseverance with all the BPAQ-SF domains) while some are not significant (Lack of premeditation with none of the BPAQ-SF domains). Similarly, the partial correlations of Sensation Seeking with the BPAQ-SF domains are significant only in the target group of prisoners (except for domain of Anger), in contrast to the non-prison comparison group, where none of the correlations are significant at the conventional $p < 0.05$ level.

Table 4 shows the results of multiple regression analysis of the BPAQ-SF aggression scores on the UPPS-P domains of impulsivity. Again, the regression models were run

separately for prisoners and for participants from the non-prison comparison group. Models were conducted on both the total aggression score and the partial BPAQ-SF domains (1. physical through 4. hostility) as dependent variables.

According to the outputs of the multiple regression models presented in Table 4, several findings can be addressed. First, Emotion-based Rash Action is the main predictor of BPAQ-SF domains of aggression, both within the group of prisoners and in the non-prison comparison group. The higher the level of Emotion-Based Rash Action, the higher are the scores on the aggression scale with a substantial effect size of 0.386 on the Total aggression score among prisoners, and 0.646 among the non-prison comparison group (reported effect sizes in terms of the *Stand. Beta* coefficient). Second, Deficits in conscientiousness were also a significant risk factor for aggression but only in prisoners, with a lower effect size of 0.237 on the Total aggression score. However, the only UPPS-P domain in the non-prison comparison group that was a significant risk factor for aggression was the Emotion-based Rash Action. Third, Sensation Seeking was found as a rather non-significant predictor for aggression after adjustment to the previous two UPPS-P domains. Fourth, these main findings were consistent for both the Total aggression score and for its three partial domains –Physical, Verbal, and Anger scales. For Hostility, as a partial domain of aggression, some deviations from these main findings were identified, suggesting its nuanced relationship with the UPPS-P domains of impulsivity. Nevertheless, these specifics are of secondary importance and do not alter the primary findings from the regression analyses.

Table 2: Pairwise correlations between the domains of impulsivity (UPPS-P) and aggression (BPAQ-SF), by study group. Spearman's rank correlation coefficients (rho).

UPPS-P domains of impulsivity		BPAQ-SF domains of aggression, by study group									
		Prisoners (N ₁ =118)					Non-prison comparison group (N ₀ =77)				
		Total Score	1. Physical	2. Verbal	3. Anger	4. Hostility	Total Score	1. Physical	2. Verbal	3. Anger	4. Hostility
1. Emotion Based Rash Action (2nd order)	rho	0.518	0.382	0.471	0.542	0.338	0.519	0.353	0.353	0.506	0.355
	<i>p-Value</i>	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.001	0.002
1a. Negative Urgency	rho	0.546	0.425	0.494	0.564	0.319	0.476	0.288	0.306	0.474	0.344
	<i>p-Value</i>	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.011	0.007	<0.001	0.002
1b. Positive Urgency	rho	0.410	0.269	0.382	0.430	0.315	0.456	0.326	0.340	0.438	0.294
	<i>p-Value</i>	<0.001	0.003	<0.001	<0.001	0.001	<0.001	0.004	0.003	<0.001	0.010
2. Deficits in Conscientiousness (2nd order)	rho	0.387	0.355	0.332	0.366	0.266	0.269	0.325	0.247	0.218	0.134
	<i>p-Value</i>	<0.001	<0.001	<0.001	<0.001	0.004	0.018	0.004	0.030	0.057	0.245
2a. (Lack of) Premeditation	rho	0.384	0.367	0.355	0.360	0.228	0.188	0.277	0.212	0.172	0.006
	<i>p-Value</i>	<0.001	<0.001	<0.001	<0.001	0.013	0.101	0.015	0.064	0.135	0.959
2b. (Lack of) Perseverance	rho	0.344	0.273	0.275	0.341	0.277	0.286	0.296	0.199	0.216	0.245
	<i>p-Value</i>	<0.001	0.003	0.003	<0.001	0.002	0.012	0.009	0.083	0.059	0.032
3. Sensation Seeking	rho	0.227	0.181	0.266	0.120	0.218	0.150	0.203	0.104	0.086	0.105
	<i>p-Value</i>	0.014	0.051	0.004	0.195	0.018	0.193	0.077	0.366	0.456	0.363

Table 3: Partial correlations between the domains of impulsivity (UPPS-P) and aggression (BPAQ-SF), by study group. Higher-order correlations adjusted to demographic confounders (gender, age, and educational attainment).

UPPS-P domains of impulsivity		BPAQ-SF domains of aggression, by study group									
		Prisoners (N ₁ =118)					Non-prison comparison group (N ₀ =77)				
		Total Score	1. Physical	2. Verbal	3. Anger	4. Hostility	Total Score	1. Physical	2. Verbal	3. Anger	4. Hostility
1. Emotion Based Rash Action (2nd order)	partial corr. <i>p-Value</i>	0.491 <0.001	0.359 <0.001	0.449 <0.001	0.513 <0.001	0.256 0.006	0.570 <0.001	0.354 0.002	0.446 <0.001	0.535 <0.001	0.393 0.001
1a. Negative Urgency	partial corr. <i>p-Value</i>	0.513 <0.001	0.400 <0.001	0.452 <0.001	0.536 <0.001	0.255 0.007	0.522 <0.001	0.321 0.006	0.381 0.001	0.514 <0.001	0.357 0.002
1b. Positive Urgency	partial corr. <i>p-Value</i>	0.362 <0.001	0.240 0.011	0.349 <0.001	0.379 <0.001	0.202 0.032	0.520 <0.001	0.326 0.005	0.433 <0.001	0.465 <0.001	0.361 0.002
2. Deficits in Conscientiousness (2nd order)	partial corr. <i>p-Value</i>	0.369 <0.001	0.297 0.001	0.285 0.002	0.355 <0.001	0.256 0.006	0.263 0.026	0.260 0.027	0.274 0.020	0.214 0.071	0.088 0.463
2a. (Lack of) Premeditation	partial corr. <i>p-Value</i>	0.338 <0.001	0.305 0.001	0.287 0.002	0.298 0.001	0.203 0.031	0.130 0.275	0.210 0.077	0.183 0.125	0.115 0.336	-0.065 0.587
2b. (Lack of) Perseverance	partial corr. <i>p-Value</i>	0.308 <0.001	0.210 0.026	0.209 0.026	0.329 <0.001	0.252 0.007	0.344 0.003	0.251 0.033	0.307 0.009	0.271 0.021	0.236 0.046
3. Sensation Seeking	partial corr. <i>p-Value</i>	0.234 0.013	0.199 0.035	0.242 0.010	0.107 0.258	0.249 0.008	0.206 0.083	0.075 0.534	0.132 0.268	0.187 0.115	0.212 0.074

Table 4: Log-linear multiple regression of the aggression domains on the main domains of impulsivity, by study group.

Independent variables (domains of impulsivity)		Dependent variables: BPAQ-SF domains (log-transformed values)									
		Total Score	1. Physical	2. Verbal	3. Anger	4. Hostility	Total Score	1. Physical	2. Verbal	3. Anger	4. Hostility
		Prisoners (N ₁ =118)					Non-prison comparison group (N ₀ =77)				
1. Emotion Based Rash Action (2nd order)	Coef.	0.199***	0.213**	0.202***	0.395***	0.037	0.323***	0.211*	0.229**	0.476***	0.336***
	(SE)	(0.045)	(0.077)	(0.053)	(0.074)	(0.044)	(0.063)	(0.096)	(0.071)	(0.102)	(0.090)
	<i>p</i> -Value	<0.001	0.006	<0.001	<0.001	0.412	<0.001	0.031	0.002	<0.001	<0.001
	exp(Coef.)	1.220	1.238	1.224	1.484	1.037	1.381	1.235	1.258	1.610	1.399
	Stand. Beta	0.386	0.270	0.351	0.488	0.082	0.646	0.306	0.454	0.606	0.501
2. Deficits in Conscientiousness (2nd order)	Coef.	0.127**	0.169*	0.120*	0.140 ⁺	0.114**	-0.099	0.150	0.010	-0.177	-0.290**
	(SE)	(0.044)	(0.075)	(0.052)	(0.072)	(0.043)	(0.078)	(0.118)	(0.087)	(0.125)	(0.110)
	<i>p</i> -Value	0.005	0.026	0.023	0.054	0.010	0.211	0.208	0.913	0.163	0.010
	exp(Coef.)	1.135	1.184	1.127	1.150	1.121	0.906	1.162	1.010	0.838	0.748
	Stand. Beta	0.237	0.205	0.200	0.166	0.246	-0.170	0.188	0.016	-0.194	-0.374
3. Sensation Seeking	Coef.	0.043	0.061	0.065	-0.034	0.074*	-0.004	-0.067	-0.046	0.014	0.077
	(SE)	(0.036)	(0.061)	(0.042)	(0.059)	(0.035)	(0.049)	(0.073)	(0.054)	(0.078)	(0.069)
	<i>p</i> -Value	0.240	0.315	0.126	0.567	0.039	0.928	0.365	0.398	0.855	0.265
	exp(Coef.)	1.044	1.063	1.068	0.967	1.077	0.996	0.935	0.955	1.014	1.080
	Stand. Beta	0.100	0.093	0.137	-0.050	0.200	-0.013	-0.138	-0.130	0.026	0.163
Breusch-Pagan test for heteroskedasticity of residuals	χ^2 (df)	0.430 (1)	0.240 (1)	0.010 (1)	0.100 (1)	0.030 (1)	0.020 (1)	1.710 (1)	0.590 (1)	0.000 (1)	0.780 (1)
	<i>p</i> -Value	0.511	0.624	0.941	0.752	0.857	0.901	0.191	0.442	0.976	0.378
	Adjusted R ²	0.358	0.232	0.292	0.316	0.181	0.286	0.144	0.126	0.257	0.206

Note: All regression coefficients are also adjusted to demographic confounders (gender, age, and educational attainment).

⁺ *p*<0.1; * *p*<0.05; ** *p*<0.01; *** *p*<0.001; (SE) stands for standard error of the coefficient; exp(Coef.) is the exponentiated value of the coefficient

Impulsivity and ADHD

Table 1 provides demographic characteristic of the participants, presented separately by the group (ADHD vs non-ADHD) and for the total sample. Altogether, $N = 140$ participants were included into the study; majority being in the non-ADHD group ($N = 117$; 83.6%).

Table 1

Table 2 provides descriptive statistics and p -values of the key measures of impulsivity and their partial domains consecutively for *BIS-11* through *UPPS-P*. As the psychometric scores were computed as means of Likert-type responses of participants across the set of domain items, the range of descriptive statistics averaged across all participants is also bounded within the same range of values. Namely, as the items of domains for *BIS-11* and *UPPS-P* used a four-point Likert-type scale, the descriptive statistics in Table 2 range between 1.0 and 4.0. Likewise, as the items of the *DGI* applied a five-point scale, the psychometric scores of its domains are bounded by 1.0 and 5.0. About half of the domains did not violate the Shapiro-Wilk assumption of normality ($p > .05$) and, thus, for those we conducted a student's t , whereas for the rest of the domains we proceeded with the nonparametric testing.

Table 2

Table 3 shows the independent samples t -tests, which specifies ADHD vs. non-ADHD as the grouping factor. Seventeen out of twenty-one domains displayed statistically significant mean

differences ($p < .05$), majority of which were $< .001$; thus, demonstrating that there is a significant difference in impulsivity when it comes to ADHD and non-ADHD groups.

Table 1

Descriptive Statistics for the Demographics

		Group				Total ($N = 140$)	
		ADHD ($N = 23$)		Non-ADHD ($N = 117$)		%	N
		%	N	%	N		
Gender	Males	7.9%	11	55%	77	62.9%	88
	Females	8.6%	12	26.6%	40	37.1%	52
Education	Primary	8.6%	12	40.7%	57	49.3%	69
	Lower Secondary	5%	7	34.3%	48	39.3%	55
	Upper Secondary	2.9%	4	7.1%	10	10%	14
	University	0%	0	1.4%	2	1.4%	2
		M	SD	M	SD	M	SD
Age		31.5	10.2	36	11.8	35.3	11.7

Table 2*Descriptive Statistics for the Measured Variables*

	Non-AHDH	ADHD	Total
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
UPPS-P (N = 117)			
Emotion Based Rash Action 2'OF	2.50 (.598)	2.98(.586)	2.58(.619)*
Sensation Seeking 2'OF	2.89(.718)	2.85(.861)	2.88(.738)
Deficits in Conscientiousness 2'OF	1.89(.527)	2.58(.643)	2.00(.599)
Negative Urgency	2.57(.659)	3.08(.681)	2.65(.685)*
Positive Urgency	2.43(.683)	2.88(.607)	2.50(.689)
(lack of) Premeditation	1.95(.700)	2.61(.658)	2.05(.730)
(lack of) Perseverance	1.83(.514)	2.56(.743)	1.94(.612)
BIS-11 (N = 139)			
Attentional 2'OF	1.98(.491)	2.67(.542)	2.09(.560)*
Motor 2'OF	2.02(.446)	2.44(.539)	2.09(.487)
Nonplanning 2'OF	2.46(.463)	2.96(.514)	2.54(.507)*
Attention 1'OF	2.06(.547)	2.90(.549)	2.20(.628)
Cognitive Instability 1'OF	1.83(.613)	2.29(.734)	1.91(.655)
Motor 1'OF	2.05(.498)	2.48(.645)	2.12(.547)
Perseverance 1'OF	1.97(.562)	2.38(.522)	2.04(.574)
Self-Control 1'OF	2.38(.549)	2.97(.504)	2.48(.583)*
Cognitive Complexity 1'OF	2.54(.501)	2.96(.594)	2.61(.538)*
DGI (N = 118)			
Food	2.82(.725)	3.10(.557)	2.86(.706)*
Physical	2.71(.630)	2.95(.727)	2.75(.649)*
Social	2.82(.580)	3.20(.548)	2.88(.590)*
Money	2.58(.917)	3.31(.738)	2.71 (.928)*
Achievement	2.73(.664)	3.41(.737)	2.84(.717)

Note. * Shapiro-Wilk $p > .05$

Table 3*Independent Samples T-Tests*

		Statistics	<i>p</i>	Effect Size
UPPS-P				
Emotion Based Rash Action 2'OF	Student's <i>t</i>	-3.151	.002	-0.8073
Sensation Seeking 2'OF	Mann-Whitney <i>U</i>	870	.874	0.0241
Deficits in Conscientiousness 2'OF	Mann-Whitney <i>U</i>	-4.948	< .001	0.5847
Negative Urgency	Student's <i>t</i>	-3.021	.003	-0.7741
Positive Urgency	Mann-Whitney <i>U</i>	-2.615	.006	0.4052
(lack of) Premeditation	Mann-Whitney <i>U</i>	-3.677	< .001	0.5241
(lack of) Perseverance	Mann-Whitney <i>U</i>	-5.146	< .001	0.5988
BIS-11				
Attentional 2'OF	Student's <i>t</i>	-6.067	< .001	-1.3848
Motor 2'OF	Mann-Whitney <i>U</i>	-4.008	< .001	0.4355
Nonplanning 2'OF	Student's <i>t</i>	-4.734	< .001	-1.0805
Attention 1'OF	Mann-Whitney <i>U</i>	-6.656	< .001	0.7155
Cognitive Instability 1'OF	Mann-Whitney <i>U</i>	-3.153	.004	0.3722
Motor 1'OF	Welch's <i>t</i>	-3.033	.005	-0.7484
Perseverance 1'OF	Mann-Whitney <i>U</i>	-3.204	.002	0.4108
Self-Control 1'OF	Student's <i>t</i>	-4.737	< .001	-1.0812
Cognitive Complexity 1'OF	Student's <i>t</i>	-3.535	< .001	-0.8068
DGI				
Food	Student's <i>t</i>	-1.608	.111	-0.4027
Physical	Student's <i>t</i>	-1.459	.147	-0.3654
Social	Student's <i>t</i>	-2.631	.010	-0.6590
Money	Student's <i>t</i>	-3.253	.001	-0.8149
Achievement	Mann-Whitney <i>U</i>	-3.977	< .001	0.4912

Discussion

Results of this study identified and confirmed higher levels of impulsivity in the prison population. The significant domains of impulsivity in prisoners included all of the *BIS-11* domains aside from the Attention and Attentional scales (second order factor); Social Interactions and Money scales in the *DGI*, and Negative and Positive Urgency, Emotion Based Rash Action and Sensation Seeking scales in the *UPPS-P*. The comparison of male prisoners and controls showed significant differences in Self-Control, Cognitive Complexity, and Nonplanning scales in the *BIS-11*; Money scale in the *DGI*; and Negative Urgency, Positive Urgency, and Emotion Based Rash Action scales in the *UPPS-P*. Females, however, showed significant differences in all of the *BIS-11* subscales aside from the Attention, Cognitive Instability, and Attentional scales (second order factor); in Money scale (*DGI*); and in Negative and Positive Urgency, Emotion Based Rash Action, and in Sensation Seeking scales (*UPPS-P*).

These results further provide an important insight into the issue of impulsivity and impulsive behavior of prisoners that in the previous studies were discussed only to a limited extent, whereas this type of assessment for the Czech Republic has been virtually non-existent. Furthermore, based on the type or domain of impulsivity the examiner would like to assess, he/she can select the appropriate measure required for the evaluation. In general, the *UPPS-P model* of impulsivity has been supported as one of the preferential scales recommended for use in practice due to its composite domains and good internal consistency (Hook et al., 2021). Furthermore, the *UPPS-P model* of impulsivity has been studied in terms of the prison population, specifically in relation to the association between aggression, negative urgency and coping deficits, which should be targeted in therapy interventions for this type of population (Bousardt et al., 2016).

Likewise, impulsivity has been shown as a strong predictor of aggression in both, the prison population as well as the control group. Furthermore, a separate analysis of the five-factor model of impulsivity measured by the UPPS-P showed Emotion-based rash action as the primary predictor of aggression in both groups. However, another domain of impulsivity, namely Deficits in Conscientiousness, predicted aggression only in the prison population sample. In contrast Sensation seeking was shown to be a rather non-significant factor.

Recent literature suggested (Cyders & Smith, 2008) that heightened emotional arousal, positive or negative, affects the ability to impartially apply acquired information, and can lead to engagement in rather risky behavior, which in this study was exhibited by higher levels of self-reported aggression. However, the prison population can manifest other forms of risky behaviors under the influence of strong emotions, including but not limited to drug involvement or heavy drug use/addiction (Bernstein et al., 2015), risky sexual activity, binge eating or non-suicidal self-injury (Miller & Racine, 2022).

Furthermore, according to Hsieh and Chen (2017) there is an association between low inhibitory control and low emotion regulation leading toward aggression. Similarly, individuals that displayed physical or verbal aggression, hostility or anger were shown to engage in more maladaptive emotion regulation strategies, such as emotion suppression, awareness, clarity or nonacceptance strategies (Avila, 2021; Garofalo et al., 2018), which are frequently displayed in the prison population, and specifically in the impulsive or violent/aggressive type of prisoners (Værøy, Western & Andersson, 2016). Therefore, it is not surprising that increased levels of impulsivity and aggression were identified as risk factors leading to near-lethal self-harm behaviors in prisoners (Rivlin et al., 2013).

A recent meta-analysis of the five-factor model of impulsivity also highlighted the importance of the lack of premeditation and its association to aggression (Bresin, 2019), which in the present study was shown to be a significant predictor only in the prison

population group. These results continue to support the conceptualization of the lack of forethought by Whiteside and Lynam (2001), where individuals are more prone to act out aggressively because of their inability to plan or think about the future consequences.

Therefore, the recommendations for the prevention of prison violence include the assessment of individual risk factors (mental health disorders, index criminal offenses, history of violent conduct or individual demographic variables) the examination of situational/institutional risk factors (security level, management, staff experience and training, mix of prisoners, overcrowding), and the involvement of prison health services (Modvig, 2014; Baggio et al., 2020). Furthermore, Dialectical Behavioral Therapy modified for correctional settings was shown to be effective in reducing aggression, impulsivity, and general psychopathology (Shelton et al., 2009).

References

- Adler, L. A., Spencer, T., Faraone, S. V., Kessler, R. C., Howes, M. J., Biederman, J., & Secnik, K. (2006). Validity of pilot Adult ADHD Self-Report Scale (ASRS) to rate adult ADHD symptoms. *Annals of Clinical Psychiatry, 18*(3), 145-148.
- Ainslie, G. (1975). Specious reward: a behavioral theory of impulsiveness and self-control. *Psychological Bulletin, 82*, 463–496. <https://doi.org/10.1037/h0076860>
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). <https://doi.org/10.1176/appi.books.9780890425596>
- Avila, A. (2021). *The influence of emotion regulation, maladaptive coping, and criminal thinking on maladaptive behavior* (Doctoral dissertation, The University of Texas at El Paso).
- Baggio, S., Peigné, N., Heller, P., Gétaz, L., Liebrez, M., & Wolff, H. (2020). Do overcrowding and turnover cause violence in prison?. *Frontiers in psychiatry, 10*15.
- Bari, A. & Robbins, T.W. (2013). Inhibition and impulsivity: Behavioral and neural basis of response control. *Progress in Neurobiology, 108*, 44-79.
- Barratt, E.S. & Patton, J.H. (1983). Impulsivity: cognitive, behavioral, and psychophysiological correlates. In M. Zuckerman (Ed.), *Biological bases of sensation seeking, impulsivity, and anxiety* (pp. 77-116). Hillsdale, NJ: Erlbaum.
- Bernstein, M. H., McSheffrey, S. N., van den Berg, J. J., Vela, J. E., Stein, L. A., Roberts, M. B., Martin, R. A., & Clarke, J. G. (2015). The association between impulsivity and alcohol/drug use among prison inmates. *Addictive behaviors, 42*, 140–143. <https://doi.org/10.1016/j.addbeh.2014.11.016>
- Black, D. W., Gunter, T., Loveless, P., Allen, J., & Sieleni, B. (2010). Antisocial personality disorder in incarcerated offenders: Psychiatric comorbidity and quality of life. *Annals of Clinical Psychiatry, 22*(2), 113-120.

- Bousardt, A. M., Hoogendoorn, A. W., Noorthoorn, E. O., Hummelen, J. W., & Nijman, H. L. (2016). Predicting inpatient aggression by self-reported impulsivity in forensic psychiatric patients. *Criminal behaviour and mental health : CBMH*, 26(3), 161–173. <https://doi.org/10.1002/cbm.1955>
- Bresin, K. (2019). Impulsivity and aggression: A meta-analysis using the UPPS model of impulsivity. *Aggression and violent behavior*, 48, 124-140.
- Broos, N., Schmaal, L., Wiskerke, J., Kostelijk, L., Lam, T., Stroop, N., Weierink, L., Ham, J., de Geus, E. J. C., Schoffeleer, A. N. M., van den Brink, W., Veltman, D. J., de Vries, T. J., Pattij, T. & Goudriaan, A. E. (2012) The Relationship between impulsive choice and impulsive action: A Cross-species translational study. *PLoS ONE*, 7(5), e36781.
- Bryant, F. B., & Smith, B. D. (2001). Refining the architecture of aggression: A measurement model for the Buss–Perry Aggression Questionnaire. *Journal of Research in Personality*, 35(2), 138-167.
- Coskunpinar, A., Dir, A. L., & Cyders, M. A. (2013). Multidimensionality in impulsivity and alcohol use: A meta-analysis using the UPPS model of impulsivity. *Alcoholism: Clinical and experimental research*, 37(9), 1441-1450.
- Costa, P. T., & McCrae, R. R. (1992). *Neo personality inventory-revised (NEO PI-R)*. Odessa, FL: Psychological Assessment Resources.
- Cyders, M. A., & Smith, G. T. (2007). Mood-based rash action and its components: Positive and negative urgency. *Personality and individual differences*, 43(4), 839-850.
- Cyders, M. A., & Smith, G. T. (2008). Emotion-based dispositions to rash action: positive and negative urgency. *Psychological bulletin*, 134(6), 807.

- De Tribolet-Hardy, F., Vohs, K., Domes, G., Regli, D., & Habermeyer, E. (2011). Violent offenders with or without antisocial personality disorder. A comparison. *Der Nervenarzt*, *82*(1), 43-49.
- Derefinko, K., DeWall, C. N., Metze, A. V., Walsh, E. C., & Lynam, D. R. (2011). Do different facets of impulsivity predict different types of aggression?. *Aggressive behavior*, *37*(3), 223-233.
- Diamond, P. M., & Magaletta, P. R. (2006). The short-form Buss-Perry Aggression questionnaire (BPAQ-SF) a validation study with federal offenders. *Assessment*, *13*(3), 227-240.
- Dir, A. L., Karyadi, K., & Cyders, M. A. (2013). The uniqueness of negative urgency as a common risk factor for self-harm behaviors, alcohol consumption, and eating problems. *Addictive behaviors*, *38*(5), 2158-2162.
- Eysenck, H.J. (1993). The nature of impulsivity. In W. G. McCown, J. L. Johnson, & M. B. Sure (Eds.), *The impulsive client: Theory, research, and treatment*. Washington, DC: American Psychological Association.
- Fazel, S., & Danesh, J. (2002). Serious mental disorders in 23,000 prisoners: A systematic review of 62 surveys. *The Lancet*, *359*, 545–550.
- Fazel, S., Hayes, A. J., Bartellas, K., Clerici, M., & Trestman, R. (2016). Mental health of prisoners: prevalence, adverse outcomes, and interventions. *The Lancet Psychiatry*, *3*(9), 871–881. [https://doi.org/10.1016/S2215-0366\(16\)30142-0](https://doi.org/10.1016/S2215-0366(16)30142-0)
- Fineberg, N.A., Chamberlain, S.R., Goudriaan, A.E., Stein, D.J., Vanderschuren, L.J.M.J., Gillan, C.M., Shekar, S., Gorwood, P.A.P.M., Voon, V., Morein- Zamir, S., Denys, D., Sahakian, B.J., Moeller, F.G., Robbins, T.W. & Potenza, M.N. (2014). New developments in human neurocognition: Clinical, genetic and brain imaging correlates of impulsivity and compulsivity. *CNS Spectrum*, *19*(1), 69- 89.

- Fornells, A. R., Capdevila, J. M. L., & Andres-Pueyo, A. (2002). Personality dimensions and prison adjustment. *Psicothema, 14*, 90-100.
- Garofalo, C., Velotti, P., & Zavattini, G. C. (2018). Emotion regulation and aggression: The incremental contribution of alexithymia, impulsivity, and emotion dysregulation facets. *Psychology of Violence, 8*(4), 470.
- Gordon, V., & Egan, V. (2011). What self-report impulsivity measure best postdicts criminal convictions and prison breaches of discipline? *Psychology, Crime & Law, 17*(4), 305–318. <https://doi.org/10.1080/10683160903203946>
- Gottfredson MR, Hirschi T. *A General Theory of Crime*. Stanford, CA: Stanford University Press; 1990.
- Gvion, Y., & Apter, A. (2011). Aggression, impulsivity, and suicide behavior: a review of the literature. *Archives of suicide research: official journal of the International Academy for Suicide Research, 15*(2), 93–112. <https://doi.org/10.1080/13811118.2011.565265>
- Haden, S. C., & Shiva, A. (2008). Trait impulsivity in a forensic inpatient sample: an evaluation of the Barratt impulsiveness scale. *Behavioral sciences & the law, 26*(6), 675–690. <https://doi.org/10.1002/bsl.820>
- Hoerger, M., Quirk, S. W., & Weed, N. C. (2011). Development and validation of the Delaying Gratification Inventory. *Psychological assessment, 23*(3), 725–738. <https://doi.org/10.1037/a0023286>
- Hook, R. W., Grant, J. E., Ioannidis, K., Tiego, J., Yücel, M., Wilkinson, P., & Chamberlain, S. R. (2021). Trans-diagnostic measurement of impulsivity and compulsivity: A review of self-report tools. *Neuroscience and biobehavioral reviews, 120*, 455–469. <https://doi.org/10.1016/j.neubiorev.2020.10.007>
- Hsieh, I. J., & Chen, Y. Y. (2017). Determinants of aggressive behavior: Interactive effects of emotional regulation and inhibitory control. *PloS one, 12*(4), e0175651.

- Lopez, R., Dauvilliers, Y., Jaussent, I., Billieux, J., & Bayard, S. (2015). A multidimensional approach of impulsivity in adult attention deficit hyperactivity disorder. *Psychiatry research, 227*(2), 290-295.
- Malloy-Diniz, L., Fuentes, D., Leite, W. B., Correa, H., & Bechara, A. (2007). Impulsive behavior in adults with attention deficit/hyperactivity disorder: characterization of attentional, motor and cognitive impulsiveness. *Journal of the International Neuropsychological Society, 13*(04), 693-698.
- Miller, J., Flory, K., Lynam, D., & Leukefeld, C. (2003). A test of the four-factor model of impulsivity-related traits. *Personality and individual differences, 34*(8), 1403-1418.
- Miller, A. E., & Racine, S. E. (2022). Emotion regulation difficulties as common and unique predictors of impulsive behaviors in university students. *Journal of American College Health, 70*(5), 1387-1395.
- Miller, J. D., Zeichner, A., & Wilson, L. F. (2012). Personality correlates of aggression: Evidence from measures of the five-factor model, UPPS model of impulsivity, and BIS/BAS. *Journal of interpersonal violence, 27*(14), 2903-2919.
- Mitchell, M.R. & Potenza, M.N. (2014). Recent Insights into the Neurobiology of Impulsivity. *Current Addiction Reports, 1*(4), 309-319.
- Modvig, J. (2014). 4. Violence, sexual abuse and torture in prisons. *Prisons and health, 19*.
- Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt impulsiveness scale. *Journal of clinical psychology, 51*(6), 768-774.
- Reynolds, B., Ortengren, A., Richards, J.B., & de Wit, H. (2006). Dimensions of impulsive behavior: Personality and behavioral measures. *Personality and individual differences, 40*(2), 305-315.

- Rivlin, A., Hawton, K., Marzano, L., & Fazel, S. (2013). Psychosocial characteristics and social networks of suicidal prisoners: towards a model of suicidal behaviour in detention. *PloS one*, *8*(7), e68944.
- Rømer Thomsen, K., Callesen, M. B., Hesse, M., Kvamme, T. L., Pedersen, M. M., Pedersen, M. U., & Voon, V. (2018). Impulsivity traits and addiction-related behaviors in youth. *Journal of behavioral addictions*, *7*(2), 317-330.
- Ruiz, M. A., Skeem, J. L., Poythress, N. G., Douglas, K. S., & Lilienfeld, S. O. (2010). Structure and correlates of the Barratt Impulsiveness Scale (BIS-11) in offenders: Implications for psychopathy and externalizing pathology. *The International Journal of Forensic Mental Health*, *9*(3), 237–244.
<https://doi.org/10.1080/14999013.2010.517258>
- Savvidou, L. G., Fagundo, A. B., Fernández-Aranda, F., Granero, R., Claes, L., Mallorquí-Baqué, N., Verdejo-García, A., Steiger, H., Israel, M., Moragas, L., del Pino-Gutiérrez, A., Aymamí, N., Gómez-Peña, M., Agüera, Z., Tolosa-Sola, I., La Verde, M., Aguglia, E., Menchón, J. M., & Jiménez-Murcia, S. (2017). Is gambling disorder associated with impulsivity traits measured by the UPPS-P and is this association moderated by sex and age? *Comprehensive Psychiatry*, *72*, 106–113.
<https://doi.org/10.1016/j.comppsy.2016.10.005>
- Shelton, D., Sampl, S., Kesten, K. L., Zhang, W., & Trestman, R. L. (2009). Treatment of impulsive aggression in correctional settings. *Behavioral sciences & the law*, *27*(5), 787-800.
- Stanford, M. S., Mathias, C. W., Dougherty, D. M., Lake, S. L., Anderson, N. E., & Patton, J. H. (2009). Fifty years of the Barratt Impulsiveness Scale: An update and review. *Personality and Individual Differences*, *47*(5), 385–395.
<https://doi.org/10.1016/j.paid.2009.04.008>

- Tharshini, N. K., Ibrahim, F., Kamaluddin, M. R., Rathakrishnan, B., & Che Mohd Nasir, N. (2021). The Link between Individual Personality Traits and Criminality: A Systematic Review. *International journal of environmental research and public health*, 18(16), 8663. <https://doi.org/10.3390/ijerph18168663>
- Tonnaer, F., Cima, M., & Arntz, A. (2016). Modeling Impulsivity in Forensic Patients: A Three-Dimensional Model of Impulsivity. *The American journal of psychology*, 129(4), 429–441. <https://doi.org/10.5406/amerjpsyc.129.4.0429>
- Værøy, H., Western, E., & Andersson, S. (2016). The link between facets of impulsivity and aggression in extremely violent prisoners. *Open Journal of Psychiatry*, 6(01), 86. <https://doi.org/10.4236/ojpsych.2016.61010>
- Wang, E. W., & Diamond, P. M. (1999). Empirically identifying factors related to violence risk in corrections. *Behavioral Sciences & the Law*, 17(3), 377–389. [https://doi.org/10.1002/\(SICI\)1099-0798\(199907/09\)17:3<377::AID-BSL351>3.0.CO;2-M](https://doi.org/10.1002/(SICI)1099-0798(199907/09)17:3<377::AID-BSL351>3.0.CO;2-M)
- Warren, J. I., & Burnette, M. (2012). Factor invariance of Cluster B psychopathology among male and female inmates and association with impulsive and violent behavior. *The Journal of Forensic Psychiatry & Psychology*, 23(1), 40–60. <https://doi.org/10.1080/14789949.2011.627442>
- White, J. L., Moffitt, T. E., Caspi, A., Bartusch, D. J., Needles, D. J., & Stouthamer-Loeber, M. (1994). Measuring impulsivity and examining its relationship to delinquency. *Journal of abnormal psychology*, 103(2), 192–205. <https://doi.org/10.1037//0021-843x.103.2.192>
- Whiteside, S. P., & Lynam, D. R. (2001). The five factor model and impulsivity: Using a structural model of personality to understand impulsivity. *Personality and individual differences*, 30(4), 669-689.

World Health Organization. (1992). *The ICD-10 classification of mental and behavioural disorders: Clinical descriptions and diagnostic guidelines*. Geneva: World Health Organization.

World Health Organization. (2022). *ICD-11: International classification of diseases* (11th revision). Geneva: World Health Organization. <https://icd.who.int/>

Young, S., Moss, D., Sedgwick, O., Fridman, M., & Hodgkins, P. (2015). A meta-analysis of the prevalence of attention deficit hyperactivity disorder in incarcerated populations. *Psychological medicine*, 45(02), 247-258.

Publikace in extenso, které jsou podkladem disertace

1) s impakt faktorem (IF)

- Příhodová, K., Fazio, R., Kázmér, L., Příhodová, T., Lawyer, S. R., Rasmussen, E. B., & Vevera, J. (2023). Impulsivity Profile in the Prison Population—a Comparative Case-Control Study. *Journal of Forensic Psychology Research and Practice*, 1-18.
- Lawyer, S. R., Prihodova, T., Prihodova, K., Rasmussen, E., Doubkova, N., & Preiss, M. (2022). Steeper delay discounting for potentially real versus hypothetical cigarettes (but not money) in Czech Republic smokers. *The Psychological Record*, 1-9.
- Rasmussen, E.B., Prihodova, T., Prihodova, K., & Lawyer, S.R. (2022). Potentially real and hypothetical food and monetary outcomes in delay and probability discounting are similar in a Czech sample. *European Journal of Behavior Analysis*, 23(1), 42-61.
- Nichtová, A., Volavka, J., Vevera, J., Příhodová, K., Juríčková, V., Klemsová, A., Páv M., Strunzová, V., Příhodová, T., Nocárová, M., Papoušková, E., Žižka P., & Kališová, L. (2021). Deconstructing violence in acutely exacerbating psychotic patients. *CNS spectrums*, 26(6), 643-647.
- Lawyer, S. R., Holcomb, B. M., & Příhodová, K. (2021). Immediate and Delayed Reactions to Trauma-related Laboratory Research Among Rape Survivors and Controls. *Journal of Empirical Research on Human Research Ethics*, 16(3), 312–324.
- Vevera, J., Zarrei, M., Hartmannová, H., Jedličková, I., Mušálková, D., Přistoupilová, A., Oliveriusová, P., Trešlová H., Nosková L., Hodaňová K., Stránecký, V., Jiříčka V., Preiss, M., Příhodová K., Šaligová J., Wei, J. Woodbury-Smith, M. Bleyer, A.J., Scherer S.W., & Knoch, S. (2019). Rare copy number variation in extremely impulsively violent males. *Genes, Brain and Behavior*, 18(6), e12536.

2) bez impakt faktoru

- Příhodová, T., Doubková, N., Příhodová K., Prajsová, J., Raisová, M., Preiss, M., Průchová, A., Sanders, EM., Lawyer, SR., Rasmussen, EB. Obezita a nadváha z pohledu impulzivního charakteru chování. *Diabetologie - metabolismus - endokrinologie - výživa*. 2020, 22(2), 69-76. ISSN 1211-9326.
- Příhodová, T., Raisová, M., Příhodová, K., Doubková, N., Prajsová, J., Lawyer, SR., Rasmussen, EB., Preiss, M. Rozdíly v dimenzích impulzivity a v temperamentu v

- závislosti na míře závislosti na kouření. *Česká a slovenská psychiatrie*. 2021, 117(1), 13-19. ISSN 1212-0383.
- Raisová, M., Příhodová, T., Příhodová, K., Lawyer, SR., Rasmussen, EB., Preiss, M. Problematika kouření cigaret a jeho vztah k impulzivitě. *Adiktologie v preventivní a léčebné praxi*. 2020, 3(2), 88-98. ISSN 2570-8120.
- Příhodová, T., Raisová, M., Příhodová, K., Lawyer, SR., Rasmussen, EB., Preiss, M. Impulzivní chování v patogenezi obezity. *Diabetologie - metabolismus - endokrinologie - výživa*. 2019, 22(4), 177-186. ISSN 1211-9326.
- Vevera, J., Černý, M., Kázmér, L., Příhodová, K., Ptáček, R., Ptáčková, H. Viktimizace pacientů trpících psychózou. *Postgraduální medicína*. 2018, 20(6), 573-579. ISSN 1212-4184