

Impulsivity and Risk-Taking as Mediators of Transition to Injecting Drug Use

Jennie Woodward¹, Adam Huxley^{2,*}

¹Department of Psychology Department, University of Kingston, Kingston upon Thames, Surrey, UK

²Department of Clinical Psychology, Change, Grow, Live, Hatfield, UK

Email address

adam.huxley@cgl.org.uk (A. Huxley)

*Corresponding author

Citation

Jennie Woodward, Adam Huxley. Impulsivity and Risk-Taking as Mediators of Transition to Injecting Drug Use. *Journal of Social Sciences and Humanities*. Vol. 1, No. 2, 2018, pp. 103-109.

Received: February 16, 2018; **Accepted:** June 12, 2018; **Published:** June 28, 2018

Abstract: This study investigated impulsivity, risk-taking and drug use amongst injectors, non-injectors and controls. Results showed a significant difference between groups on measures of risk and impulsivity, supporting the notion of wider mediating factors that support the onset and maintenance of Injecting.

Keywords: Injecting Drug Use, Impulsivity, Addiction

1. Introduction

The misuse of substances concerns a wide variety of behaviours and includes the overuse of prescribed medicines, illicit substances such as heroin, cocaine and cannabis, and legal substances such as alcohol and tobacco. As a continuum disorder, users often report a relapsing remitting condition punctuated by periods of abstinence and mediated by a number of personality, health, social and familial factors. There has been considerable interest in intrinsic factors that mediate the onset, maintenance and recovery from substance misuse. Personality and cognitive factors such as locus of control, reward, motivation, drive, choice and impulsivity have all been implicated as determinants of continuous use. Drug use is associated with high levels of impulsivity [1]. Impulsivity and risk-taking have consistently been shown to be closely related to substance use disorders in a variety of ways. DSM-IV details a number of 'impulse control disorders not elsewhere classified' that include pathological gambling [2]. Impulsivity appears to function as both a pre-morbid determinant and a consequence of drug use [3]. Previous research argues that regions of the frontal cortex involved in inhibitory response control are directly affected by long-term exposure to substance misuse, motivation to seek out and use substances may be due to cortical and amygdala dysfunction which impairs inhibitory control [4]. Variation in dopamine receptor expression has been linked to individual differences in impulsive behavior. The DRD2 A1

allele, a polymorphism associated with D2 receptor hypofunction, is prevalent in attention deficit hyperactivity disorder and substance misuse, both of which are characterised by impulsivity [5].

Injecting drug use remains a public health concern due to the high risk of transmission of blood borne viruses (BBV) and premature mortality [6]. Estimates from European Monitoring suggest an average prevalence of injecting drug use of about 2.5 cases per 1 000 population aged 15–64, an estimate of between three quarters of a million and one million active injecting drug users with a higher prevalence in East European countries [7]. Generally there is a decline in IDU over the past 5 years, with estimates of injecting drug in the United Kingdom at 133,112 in 2011 which is a rate of 3.27 per 1,000 of the population aged 15-64, this estimate shows a significant decrease in injecting drug use from 2007 which was at 164,036 a rate of 4.18 per 1,000 of the population. Data submitted to NDTMS highlights that people entering treatment services in 2009-2010 were less likely to have injected with 40,000 self-reporting no previous IDU. Drug treatment and harm-reduction measures have helped users to stop injecting, with half of all IDU reporting cessation of needle use within six months, although there is longitudinal evidence that multiple transitions in and out of injecting drug use are also typical [8]. The risks associated with the onset or transition to IDU is not solely attributable to personal risk characteristic such as personality traits and is indicative of wider mediators such as social network

characteristics [9], needle fixation [10] as well as particular aspects of the local drug supply and economy [11].

Studies have shown that drug users score higher on self-report personality measures of impulsivity [12]. A number of studies using objective behavioral tasks show drug users favor immediate rewards compared to delayed rewards. Greater discounting has been reported with opioid-dependent individuals [13], cocaine users [14], alcohol users [15], cigarette smokers [16] and individuals with unspecified histories of drug dependence [17]. Although fewer studies have compared users and non-users on measures of behavioral inhibition, there is evidence that both cocaine and methamphetamine users perform more poorly than control subjects on the Stop-Signal Task [18].

There is evidence to suggest that drug-users show increased impulsivity compared to controls and that the magnitude of discounting is dependent on the type of reward available with higher levels of impulsivity in situations related to drug use. Studies have found that high and low ecstasy users and poly drug-users reported higher levels of impulsivity, venturesomeness and novelty-seeking compared to non-drug users with ecstasy users making more risky choices on betting tasks than controls [19]. Other studies have found that different aspects of neuropsychological measures of impulsivity appear to be associated with exposure to different opioids [20]. Other research has found that opioid dependent individuals discounted delayed hypothetical monetary rewards significantly more than non-drug users [21]. Interestingly, they also found that opioid dependent individuals discounted delayed hypothetical heroin more so than they did monetary rewards. Other studies have compared current injecting drug users and former drug users and found that current injectors had higher rates of discounting than former drug users [22].

There is now a growing consensus that impulsivity is a multi-dimensional construct and that the various impulsivity measures probably reflect separate underlying processes [23]. It has been proposed that two components of impulsivity, reward sensitivity and rash impulsiveness contribute to the development of substance use disorders [24]. It has been found that individuals with lower levels of dopamine concentration in neural pathways are more likely to abuse drugs; this low level of dopamine makes an individual highly receptive to the reinforcement value of rewarding stimuli [25]. This increased reward sensitivity may serve as a vulnerability marker for substance use and result in impaired inhibitory control consequently increasing rash impulsiveness and suggests these two facets of impulsivity may interact together and play a role in the maintenance of long-term chronic drug exposure; reward sensitivity induces craving and motivation to use drugs and rash impulsiveness influences drug-taking behaviour and the failure to discontinue substance abuse regardless of negative consequences [26]. The five factor model and impulsivity suggests four personality facets associated with impulsive-

like behaviour; urgency, (lack of) premeditation, (lack of) perseverance, and sensation seeking.

2. Method

2.1. Participants

Table 1. Participant Information.

Variable	Age	
Gender	36 males	$M= 33.66, SD= 6.97$
	24 females	$M= 29.33, SD= 9.34$
Injecting Status	Injecting 20	$M= 35.55 \text{ years}, SD= 6.57$
	Non-Injecting 20	$M= 35.10 \text{ years}, SD= 7.71$
	Controls 20	$M= 25.15 \text{ years}, SD= 5.84$

A total of 60 participants were recruited into the drug using sample; 36 males ($mean\ age= 33.66, SD= 6.97$) and 24 females ($M= 29.33, SD= 9.34$). 20 injecting drug users ($M= 35.55 \text{ years}, SD= 6.57$) and 20 non-injecting drug users ($M= 35.10 \text{ years}, SD= 7.71$) were gathered from an integrated drug and alcohol treatment service in Hemel Hempstead, UK. As part of a comprehensive assessment process all clients were screened for co-morbid mental health difficulties, none of the sample reported symptoms of mental health difficulties that reached clinical significance. 37 (92.4%) of the sample were White British, 1 (2.5%) Asian and 2 (5%) European other. 20 participants non-drug user/controls ($M= 25.15 \text{ years}, SD= 5.84$) were recruited from Kingston University and were matched on age, gender and ethnicity. Participants were allocated to the relevant drug status conditions (IDU, Non IDU and control) based on their answers to the drug history questionnaire. Figure 1 details primary drug use of the sample, although poly drug use was reported amongst 39 (97.5%) of the drug using sample, 13 (32.5%) were currently employed. 10 (25%) respondents reported previously overdosing and 4 (10%) reported current BBV infection. Clients with co-morbid mental health problems were excluded from the study as the presence of co-morbid mental health difficulties might have increased the level of impulsivity.

2.2. Measures

The measures used included the drug history questionnaire (DHQ), a 13-item questionnaire that asks about participant's age, gender and ethnicity and current or previous drug use including injecting behaviour. Impulsivity was measured by the Eysenck impulsivity questionnaire (IVE, 1-7) [27], a 54-item questionnaire with three scales impulsiveness, venturesomeness and empathy which has adequate reliability as an estimate of impulsivity [28]. Risk taking was measured with a 16-item hypothetical delayed-discounting money choice task and a hypothetical lottery money choice task [29], in which participants must choose between a guaranteed hypothetical financial reward and a chance of a larger but risky hypothetical financial reward.

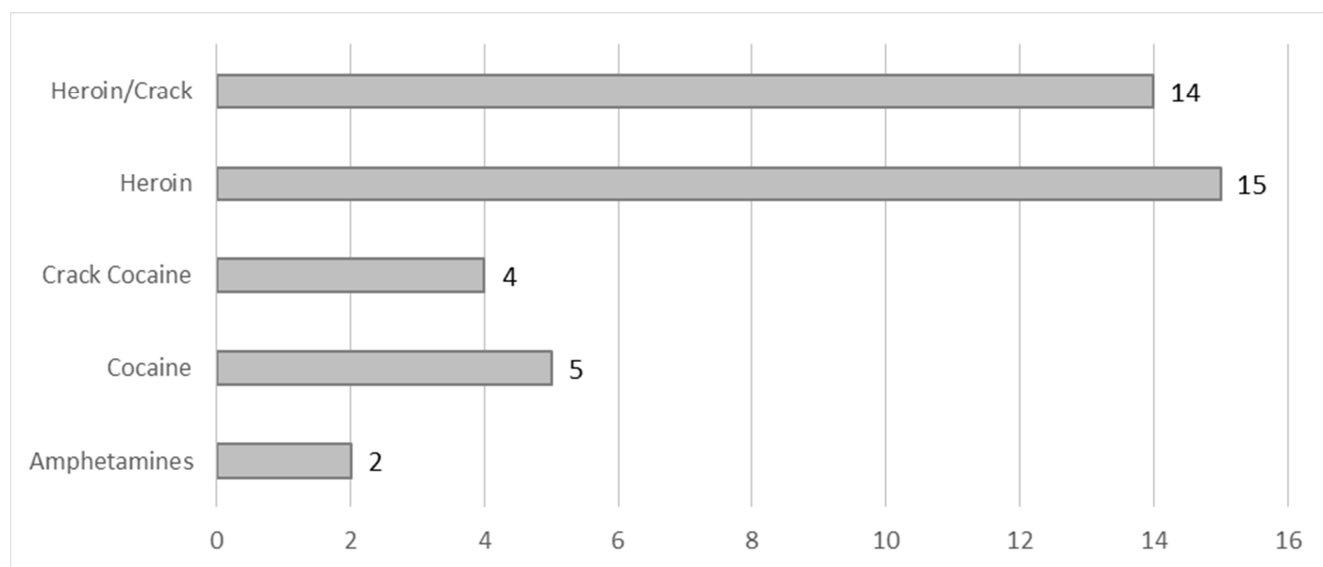


Figure 1. Primary Drug Use of Sample.

Ethical approval was granted by the University of Kingston. This study used a between-subjects design with one independent variable (drug use) with three levels (injecting drug user, non-injecting drug user and non-drug user control) and two dependent variables (impulsivity and risk-taking).

3. Results

Data was analysed using SPSS statistical package. A one-way analysis of variance (ANOVA) was conducted on age distribution and a significant difference was found between groups $F(2, 57) = 15.15, p = .001$. There was no significant differences in age distribution between the injecting ($M = 35.55$ years, $SD = 6.57$) and non-injecting drug users ($M = 35.10$ years, $SD = 7.71$), the age distribution of the non-drug users was significantly different from both drug groups, with non-drug users being significantly younger ($M = 25.15$ years, $SD = 5.84$).

Chi-square analysis was performed on gender distribution and a significant difference between drug group was found $\chi^2(2, N = 60) = p < .001$. Analysis of the injecting and non-injecting drug user conditions demonstrated that 97.5% of participants were polydrug users. Main drug for participants was heroin (37.5%), heroin and crack cocaine (35%), cocaine (12.5%), crack cocaine (10%) and amphetamines (5%). Half of the participants were current users and half were previous users with abstinent periods ranging from 3 weeks to 5 years. Only 25% of participants reported ever experiencing, 10%

reported testing positive for any BBV's. 67.5% were currently unemployed and 92.5% were white British.

Figure 2 details responses to Eysenck impulsivity questionnaire. All measures were subject to a one-way analysis of variance. Levene's test was not significant ($p > 0.05$) so we can assume that homogeneity of variance has been met. ANOVA found that the groups differed significantly on this scale $F(2, 57) = 6.00, p = .004$. Further Bonferroni post-hoc analysis revealed a significant difference between non-drug users and injecting drug users, $p = .005$, and a significant difference between non-drug users and non-injecting drug users $p = .04$. No significant differences were found between injecting and non-injecting drug users $p = 1$. For the venturesomeness scale of the IVE, Levene's test was significant ($p < 0.05$) so we can assume that homogeneity of variance has not been met therefore results for this subscale should be interpreted with caution. The ANOVA found that the groups differed significantly on this scale $F(2, 57) = 6.18, p = .004$. Both injecting and non-injecting drug users scored higher than non-drug users, there was also a slight difference between the drug user groups with injecting drug users scoring higher. Post-hoc Bonferroni analysis indicated that there was a significant difference between non-drug users and injecting drug users, $p = .003$. But no significant differences were found between non-drug users and non-injecting drug users, $p = .19$ and no significant differences between injecting and non-injecting drug users, $p = .32$. There were no significant differences between conditions on measures of empathy $F(2, 57) = .88, p = .42$.

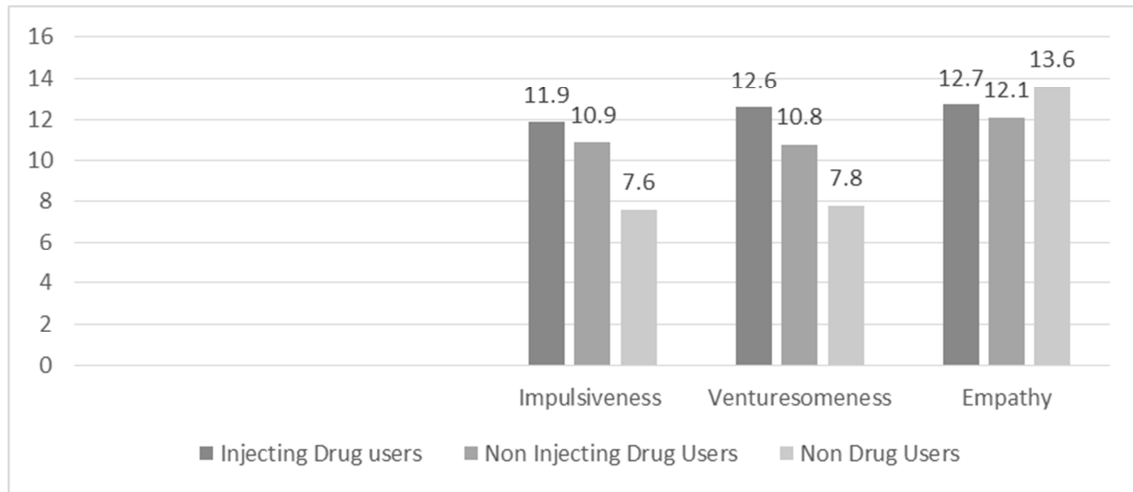


Figure 2. Mean sum of scores for Eysenck Impulsivity domains.

The mean scores for each condition on the hypothetical lottery money-choice task are presented in figure 3.

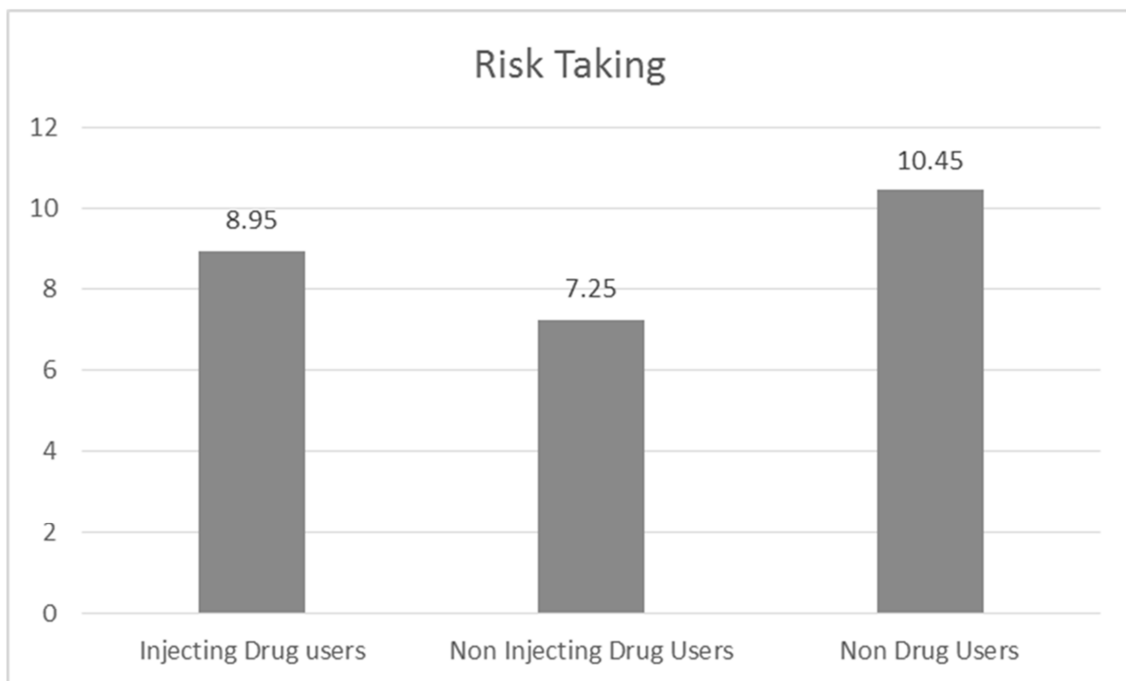


Figure 3. Mean scores for each condition on the hypothetical lottery money choice task.

The Levene's test was significant ($p < 0.05$) so we can assume that homogeneity of variance has not been met therefore findings on this measure should be interpreted with caution. The ANOVA found that the groups differed significantly on rate of discounting $F(2, 57) = 17.10$, $p = .001$. Both injecting and non-injecting drug users discounted delayed rewards at a greater rate than the non-drug users. A small difference is shown between injecting and non-

injecting drug users with injecting drug users displaying a higher level of discounting. Further post-hoc bonferroni analysis indicated a significant difference between non-drug users and injecting drug users, $p = .001$ and non-drug users and non-injecting drug users, $p = .001$. No significant differences were found between injecting and non-injecting drug users, $p = .16$.

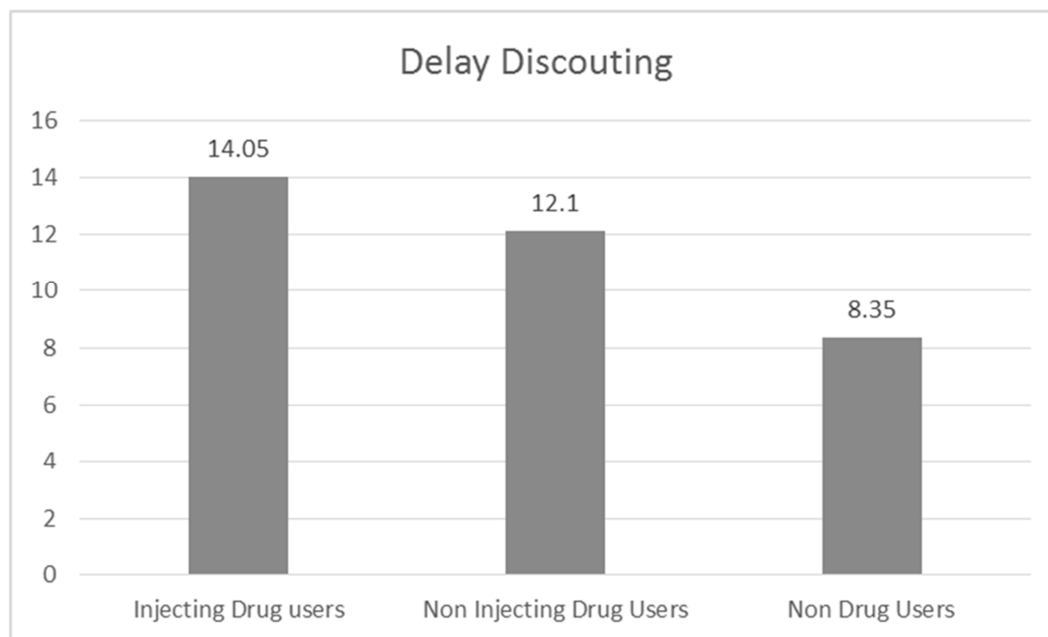


Figure 4. Mean sum of scores for hypothetical delay discounting tasks.

The mean scores for each condition on the hypothetical lottery money choice task are presented in figure 4. As can be seen non-drug users reported a higher level of risk-taking than both injecting and non-injecting drug users. However, a one-way ANOVA showed that these differences were not statistically significant $F(2, 57) = 2.09, p = .1$.

4. Discussion

The present study aimed to examine the association between impulsivity, risk-taking and drug use. Overall the results of the present study confirm that drug users report higher levels of impulsivity and display greater risk taking on hypothetical tasks compared to a non-using control group. There were no significant differences when the drug using group was separated out in terms of injecting status. Post-hoc analysis revealed that both drug using groups reported significantly higher levels of impulsivity than non-drug users on this measure. Significant differences were also found on the venturesomeness subscale. On the second measure of impulsivity, the hypothetical delay-discounting money choice task, post-hoc analysis indicated that injecting and non-injecting drug users reported greater rates of discounting than non-drug users. This is consistent with previous research, indicating higher levels of impulsivity among drug users than non-drug users. In the second measure of risk-taking, the hypothetical lottery money choice task, the results were not significant. Although not significant the results for this measure indicate a slightly higher level of risk-taking in the non-drug user group compared to the injecting and non-injecting drug user groups. Overall, the findings of the present study support the notion that drug users are more impulsive than non-drug users which supports previous research in this area. The association between drug use and risk-taking was only partly supported. The current findings

do not support the hypothesis that injecting drug users will be more impulsive and risk-taking than non-injecting drug users. However, almost half of the drug user participants were abstinent at the time of the study for periods ranging from 3 weeks to 5 years it is argued that this may have affected the overall results.

5. Conclusions

Much literature has converged on the notion that impulsivity is associated with polydrug use. Individuals that engage in multi-drug use have been shown to have greater levels of self-reported impulsivity than controls [19] and even higher levels of impulsivity than those with a lower level of multi-drug use [30]. In the present study 97.5% of the injecting and non-injecting drug users were polydrug users consequently this could have contributed to their similar scoring on both measures of impulsivity and thus may be a factor in why no differences were found between them. Severity of drug use has also been linked with impulsivity [31] and studies have found that extent of drug-use was significantly associated with increased impulsivity [31].

The current study does have some methodological limitations which may have affected the results found including relatively small sample size. In conclusion it is evident that impulsive and risk-taking behaviour is significantly associated with drug use. The current study supports previous literature in finding that drug users are significantly more impulsive than non-drug users and partly confirms previous findings of greater levels of risk-taking among drug users. Contrary to predictions no differences in impulsive or risk-taking behaviour were found between injecting and non-injecting drug users however methodological issues within the current experiment may have disguised these differences. Understanding some of the

intrinsic motivations that might support IDU will help services identify preventive interventions that support harm reduction approaches.

References

- [1] Johnson, S. L., Turner, R. J., & Iwata, N. (2003). BIS/BAS levels and psychiatric disorder: An epidemiological study. *Journal of Psychopathology and Behavioral Assessment*, 25, 25-36. doi: 10.1023/A:1022247919288.
- [2] American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Arlington, VA: Author.
- [3] Tarter, R. E., Kirisci, L., Feske, U., & Vanyukov, M. (2007). Modeling the pathways linking childhood hyperactivity and substance use disorder in young adulthood. *Psychology of Addictive Behaviours*, 21, 266. doi.org/10.1037/0893-164X.21.2.266.
- [4] Jentsch, J. D., & Taylor, J. R. (1999). Impulsivity resulting from frontostriatal dysfunction in drug abuse: implications for the control of behavior by reward-related stimuli. *Psychopharmacology*, 146, 4, 373-390. doi.org/10.1007/PL00005483.
- [5] Noble, E. P. (2003). D2 dopamine receptor gene in psychiatric and neurologic disorders and its phenotypes. *American Journal of Medical Genetics Part B: Neuropsychiatric Genetics*, 116, 103-125. doi.org/10.1002/ajmg.b.10005.
- [6] Degenhardt, L., Mathers, B., Vickerman, P., Rhodes, T., Latkin, C., & Hickman, M. (2010). Prevention of HIV infection for people who inject drugs: why individual, structural, and combination approaches are needed. *The Lancet*, 376, 285-301. doi.org/10.1016/S0140-6736(10)60742-8.
- [7] Paraskevis, D., Nikolopoulos, G., Tsiara, C., Paraskeva, D., Antoniadou, A., Lazanas, M., et al. (2011). HIV-1 outbreak among injecting drug users in Greece, 2011: a preliminary report. *Euro Surveill*, 16, 19962. Available online: <http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19962>.
- [8] Galai, N., Safaeian, M., Vlahov, D., Bolotin, A., & Celentano, D. (2003). Longitudinal patterns of drug injection behavior in the ALIVE Study cohort, 1988–2000: description and determinants. *American Journal of Epidemiology*, 158, 695-704 doi.org/10.1093/aje/kwg209.
- [9] De, P., Cox, J., Boivin, J. F., Platt, R. W., & Jolly, A. M. (2007). The importance of social networks in their association to drug equipment sharing among injection drug users: a review. *Addiction*, 102, 1730-1739. doi.org/10.1111/j.1360-0443.2007.01936.x.
- [10] Pates, R. M., McBride, A. J., Ball, N., & Arnold, K. (2001). Towards an holistic understanding of injecting drug use: An overview of needle fixation. *Addiction Research & Theory*, 9, 3-17. doi.org/10.3109/16066350109141769.
- [11] Guise, A., Dimova, M., Ndimbii, J., Clark, P., & Rhodes, T. (2015). A qualitative analysis of transitions to heroin injection in Kenya: implications for HIV prevention and harm reduction. *Harm Reduction Journal*, 12, 27. doi.org/10.1186/s12954-015-0061-2.
- [12] Moeller, F. G., Dougherty, D. M., Barratt, E. S., Schmitz, J. M., Swann, A. C., & Grabowski, J. (2001). The impact of impulsivity on cocaine use and retention in treatment. *Journal of Substance Abuse Treatment*, 21, 193-198. doi.org/10.1016/S0740-5472(01)00202-1.
- [13] Kirby, K. N., Petry, N. M., & Bickel, W. K. (1999). Heroin addicts have higher discount rates for delayed rewards than non drug-using controls. *Journal of Experimental Psychology: General*, 128, 78. doi.org/10.1037/0096-3445.128.1.78.
- [14] Coffey, S. F., Gudleski, G. D., Saladin, M. E., & Brady, K. T. (2003). Impulsivity and rapid discounting of delayed hypothetical rewards in cocaine-dependent individuals. *Experimental and Clinical Psychopharmacology*, 11, 18. doi.org/10.1037/1064-1297.11.1.18.
- [15] Vuchinich, R. E., & Simpson, C. A. (1998). Hyperbolic temporal discounting in social drinkers and problem drinkers. *Experimental and clinical psychopharmacology*, 6, 292. doi.org/10.1037/1064-1297.6.3.292.
- [16] Bickel, W. K., & Marsch, L.A. (2001). Toward a behavioral economic understanding of drug dependence: delay discounting processes. *Addiction*, 96, 73-86. doi.org/10.1046/j.1360-0443.2001.961736.x.
- [17] Von Diemen, L., Bassani, D. G., Fuchs, S. C., Szobot, C. M., & Pechansky, F. (2008). Impulsivity, age of first alcohol use and substance use disorders among male adolescents: a population based case-control study. *Addiction*, 103, 1198-1205. doi.org/10.1111/j.1360-0443.2008.02223.x.
- [18] Monterosso, J. R., Aron, A. R., Cordova, X., Xu, J., & London, E. D. (2005). Deficits in response inhibition associated with chronic methamphetamine abuse. *Drug and alcohol dependence*, 79, 273-277. doi.org/10.1016/j.drugalcdep.2005.02.002.
- [19] Butler, G., & Montgomery, A. (2004). Impulsivity, risk taking and recreational 'ecstasy' (MDMA) use. *Drug and Alcohol Dependence*, 76, 55-62. doi.org/10.1016/j.drugalcdep.2004.04.003.
- [20] Baldacchino, A., Balfour, D., & Matthews, K. (2015). Impulsivity and opioid drugs: differential effects of heroin, methadone and prescribed analgesic medication. *Psychological Medicine*, 45, 1167-1179. doi.org/10.1017/S0033291714002189.
- [21] Madden, G. J., Petry, N. M., Badger, G. J., & Bickel, W. K. (1997). Impulsive and self-control choices in opioid-dependent patients and non-drug-using control patients: Drug and monetary rewards. *Experimental and Clinical Psychopharmacology*, 5, 256. doi.org/10.1037/1064-1297.5.3.256.
- [22] Bretteville-Jensen, A. L. (1999). Addiction and discounting. *Journal of Health Economics*, 18, 393-407. doi.org/10.1016/S0167-6296(98)00057-5.
- [23] Reynolds, B., & Schiffbauer, R. (2004). Measuring state changes in human delay discounting: an experiential discounting task. *Behavioural Processes*, 67, 343-356. doi.org/10.1016/S0376-6357(04)00140-8.
- [24] Dawe, S., Gullo, M. J., & Loxton, N. J. (2004). Reward drive and rash impulsiveness as dimensions of impulsivity: implications for substance misuse. *Addictive Behaviors*, 29, 1389-405. doi.org/10.1016/j.addbeh.2004.06.004.

- [25] Dawe, S., & Loxton, N. J. (2004). The role of impulsivity in the development of substance use and eating disorders. *Neuroscience & Biobehavioral Reviews*, 28, 343-351. doi.org/10.1016/j.neubiorev.2004.03.007.
- [26] 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, 669-689. doi.org/10.1016/S0191-8869(00)00064-7.
- [27] Eysenck, S. B., Pearson, P. R., Easting, G., & Allsopp, J. F. (1985). Age norms for impulsiveness, venturesomeness and empathy in adults. *Personality and Individual Differences*, 6, 613-619. doi.org/10.1016/0191-8869(85)90011-X.
- [28] Corulla, W. J. (1987). A psychometric investigation of the Eysenck Personality Questionnaire (Revised) and its relationship to the I. 7 Impulsiveness Questionnaire. *Personality and Individual Differences*, 8, 651-658. doi.org/10.1016/0191-8869(87)90062-6.
- [29] Brennan, I. R., Moore, S. C., & Shepherd, J. P. (2010). Aggression and attitudes to time and risk in weapon-using violent offenders. *Psychiatry Research*, 178, 3, 536-539. doi.org/10.1016/j.psychres.2009.05.006.
- [30] Vassileva, J., Gonzalez, R., Bechara, A., & Martin, E. M. (2007). Are all drug addicts impulsive? Effects of antisociality and extent of multidrug use on cognitive and motor impulsivity. *Addictive Behaviors*, 32, 3071-3076. doi.org/10.1016/j.addbeh.2007.04.017.
- [31] Hanson, K. L., Luciana, M., & Sullwold, K. (2008). Reward-related decision-making deficits and elevated impulsivity among MDMA and other drug users. *Drug and Alcohol Dependence*, 96, 99-110. doi.org/10.1016/j.drugalcdep.2008.02.003.